Annual Report
Resource Management Branch
Mineral Resources Division

1991

Ministry of Energy, Mines
and Petroleum Resources

Honourable Anne Edwards, Minister

July, 1992

Ministry of Energy, Mines and Petroleum Resources
Mineral Resources Division

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FOREWORD

The Engineering and Inspection Branch was established in 1877. By a century later, the information in the ministry's annual reports had grown so large that it became unmanageable in one volume. Rather than reduce the level of reporting, however, the Ministry chose to divide the material into several publications.

Between 1975 and 1988, the Engineering and Inspection Branch reported in the publication entitled Mining in British Columbia. In 1989, the material was re-arranged and the title of the publication changed to the Annual Report of the Engineering and Inspection Branch, to more clearly reflect the scope and content of the material presented.

In the early 1990s, in line with increased national and international environmental awareness, the Branch assumed a more pro-active role in the British Columbia mining industry. The Branch heightened its initiatives in preventing environmental and socio-economic disruptions as a result of mining or mineral exploration activities, and in line with this expanded role, in 1991 changed its name to the Resource Management Branch.

This year's annual report has been produced by Yorkshire Resources, from information prepared by Ministry of Energy, Mines and Petroleum Resources (MEMPR) staff and directly from the provincial mining sector.

Readers may also wish to obtain copies of other MEMPR publications, such as:

- The Ministry of Energy Mines and Petroleum Resources Annual Report which summarizes the work of the Mineral Resources, Energy and Petroleum Resources Divisions.
- Mineral Market Update, produced quarterly, which provides information on mineral markets, mining operations, exploration activities and projects in the Mine Development Review Process, as well as maps showing the location of major operating mines and exploration/development projects in the province.
- British Columbia Mine Statistics, annual summary tables giving historical mineral production to the present.
- Detailed descriptions of new provincial mineral exploration projects are provided in the annual information circular, British Columbia Mineral Exploration Review.

A catalogue of the Ministry's other publications and help in ordering is available through the various outlets of Crown Publications.

Further information on the activities of the various mining companies can be found in the Canadian Mines Handbook published each year by Northern Miner Press Limited. In addition, the Mining Association of British Columbia and the Coal Association of Canada each issue annual reports on the status of those sectors.

Map 1. Resource Management Branch Regions and Regional offices

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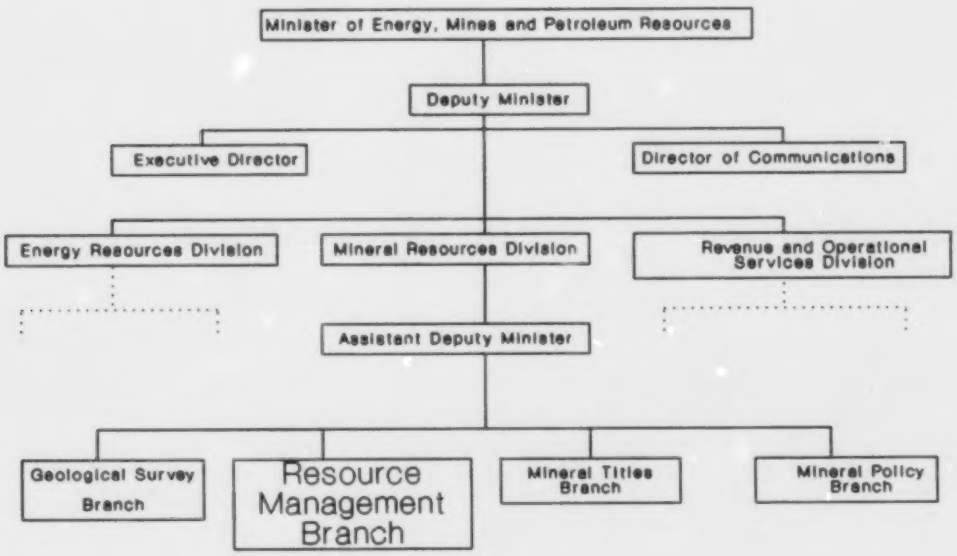
PART 1: BRANCH OVERVIEW

1.1. INTRODUCTION

1.1.1. Branch Position within the Ministry



1.1.2 Branch Mandate

The activities of the Resource Management Branch aim to fulfil two major areas defined in the Branch mandate:

1. To ensure worker health and safety, public safety, and suitable reclamation and protection of the land and watercourses affected by mining and exploration work.

2. To monitor mining activity to ensure optimum resource extraction.

1.1.3 Branch Functions

Key functions of the Resource Management Branch in carrying out its mandate are:

1. Reviewing mining and exploration proposals, issuing approvals and reclamation permits.

2. Conducting mine inspections and monitoring mining activity for conformance with the *Mines Act* and approved mining plans.

3. Collecting data and maintaining records.

The Branch also participates in various special projects to further research and increase knowledge in all aspects of its mandate.

1.1.4 Branch Address List

Victoria:
105-525 Superior Street, Victoria, B.C., V8V 1X4
Tel: (604) 387-3781 Fax: (604) 387-5985

Vancouver:
904-865 Hornby Street, Vancouver, B.C., V6Z 2G3
Tel: (604) 660-9371 Fax: (604) 660-0175

Fernie:
Main Office:
Corner of Pine Avenue and Coal Creek Road
Bag 1000, Fernie, B.C., V0B 1M0
Tel: (604) 423-6884 Fax: (604) 423-3194

Satellite Office:
100 Cranbrook Street North, Cranbrook, B.C., V1C 3P9
Tel: (604) 426-1557 Fax: (604) 426-1253

Kamloops:
200-2985 Airport Drive, Kamloops, B.C., V2B 7W8
Tel: (604) 828-4566 Fax: (604) 828-4726

Nanaimo:
1A - 3411 Shenton Road, Nanaimo, B.C., V9T 2H1
Tel: (604) 755-2486 Fax: (604) 755-2474

Nelson:
403 Vernon Street
310 Ward Street, Nelson, B.C., V1L 5S4
Tel: (604) 354-6125 Fax: (604) 354-6120

Prince George:
1652 Quinn Street, Prince George, B.C., V2N 1X3.
Tel: (604) 565-6125 Fax: (604) 565-6015

Smithers:
1st Floor, Courthouse Building, 3793 Alfred Avenue,
Bag 500, Smithers, B.C., V0J 2N0.
Tel: (604) 847-7383 Fax: (604) 847-7603

1.2 LEGISLATION

The Resource Management Branch derives its mandate from the *Mines Act SBC 1989 c.56* and the accompanying *Health, Safety and Reclamation Code for Mines in British Columbia.*

The new *Mines Act* replaces the *Mines Act SBC 1980 c.28,* the *Mines Regulation,* the *Coal Mines Regulation,* the *Exploration Regulation - Uranium and Thorium, 1987* and the *Workplace Hazardous Materials Information System Regulations.*

The *Health, Safety and Reclamation Code* is divided into eleven parts:

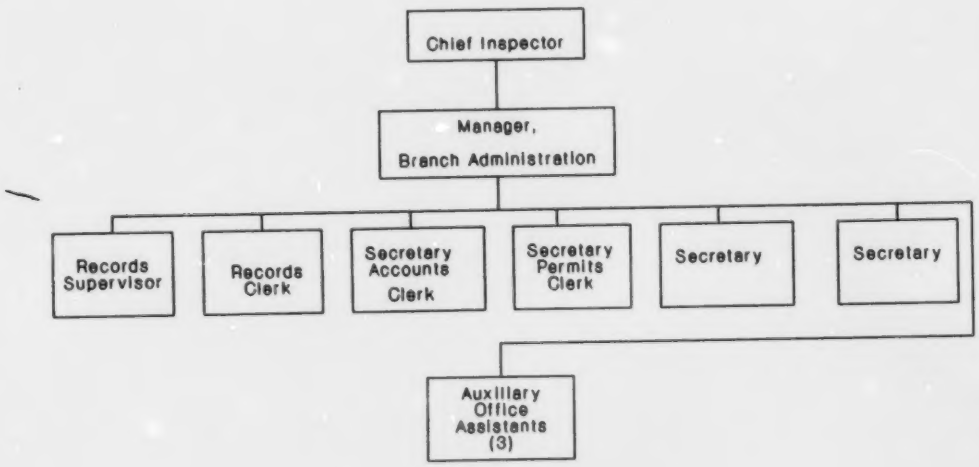
1. General Rules
2. Industrial Hygiene
3. Emergency Procedures
4. Buildings, Machinery and Equipment
5. Electrical Power Systems
6. Mine Design and Procedures
7. Hoists and Shafts
8. Explosives
9. Dams and Waste Emplacements
10. Reclamation and Abandonment
11. Exploration.

The staff of the Resource Management Branch was actively involved in drawing up the new Code. A steering committee, comprising representatives from labour, industry and government, and chaired by the Chief Inspector, produced the final draft which was distributed to concerned parties for final input prior to Proclamation. The Steering Committee completed its first annual review of the Code in 1991 to ensure it remains current with regard to new technology, mining practices and health and safety concerns. The revised Code will be published in early 1992.

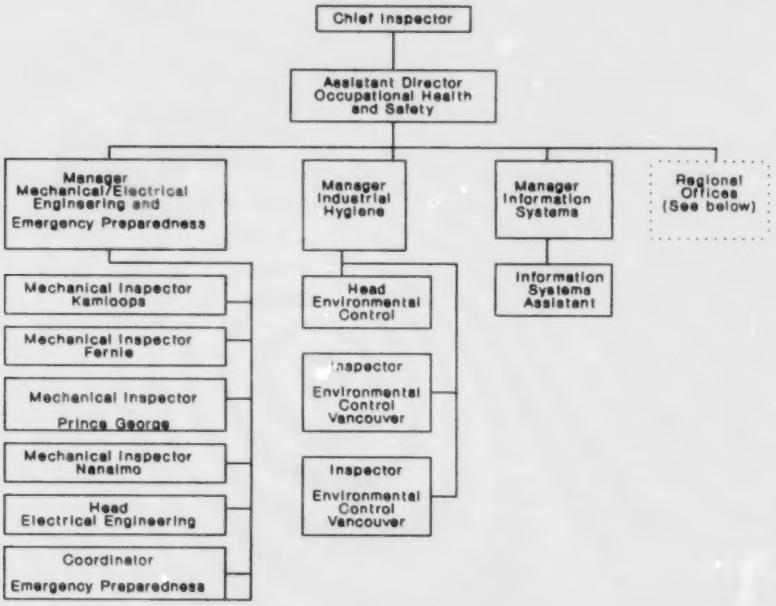
1.3 BRANCH STRUCTURE

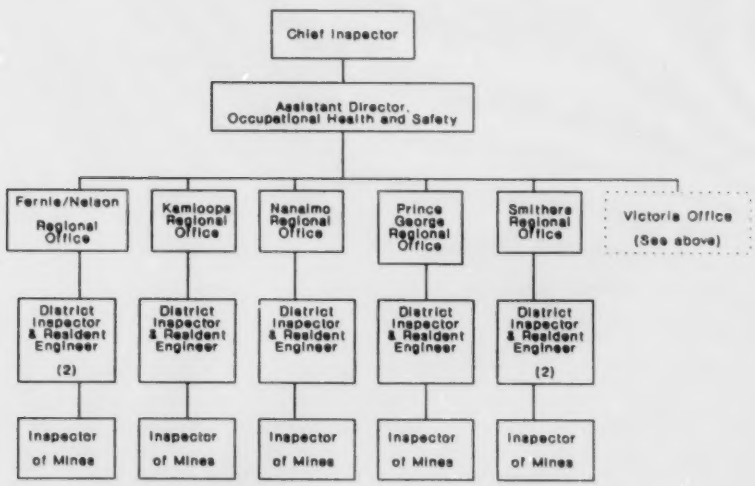
1.3.1. Overview of Branch Structure

1.3.2 Administration

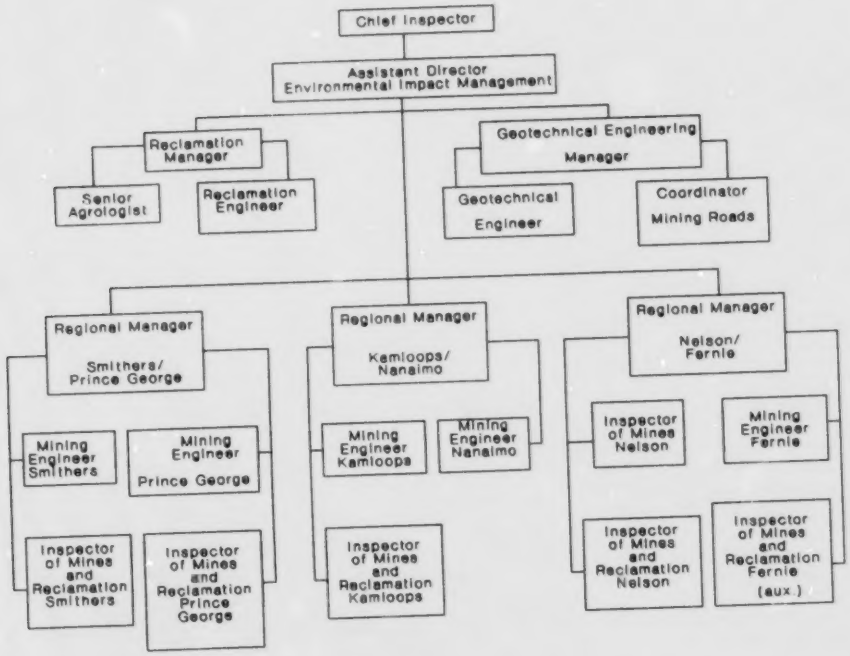


1.3.3 Occupational Health and Safety





1.3.4 Environmental Impact Management



1.4. 1991 OVERVIEW STATISTICS

1.4.1. Production and Employment at Major British Columbia Mines, 1991

Inspection District #	Mine/Owner or Operator	Tonnes Milled	Principal Minerals	Average Employed
1	Cassiar/Princeton Mining Corp.	873 732	Asbestos	363
	Golden Bear/Golden Bear Op.Co.	111 699	Gold,Silver	84
	Premier/Westmin Resources Ltd.	526 868	Gold,Silver	116
	*SB Project/Westmin Resources Ltd.	102 539	Copper,Gold	25
	Snip/Cominco Ltd.	122 648	Gold	120
2	Bell/Noranda Minerals Ltd.	4 871 473	Copper,Gold,Silver	265
	Equity/Equity Silver Mines Ltd.	3 312 800	Copper,Gold,Silver	182
	Lawyers/Cheni Gold Mines Ltd.	175 165	Gold,Silver	149
	*Shasta/Int'l Shasta Res. Ltd.	41 944	Gold,Silver	17
	*Multinational B Zone/Sable Resources	9 992	Gold,Silver	21
3	*Blackdome/Blackdome Mining Corp.	2 150	Gold,Silver	6
	Highland Valley/Highland Valley Copper	46 291 933	Copper,Gold,Silver,Molybdenum	1 214
4	*Beaverdell/Teck Corp.	5 019	Lead,Zinc,Silver	6
	Goldstream/Bethlehem Resources Corp.	249 714	Copper,Gold,Silver,Lead,Zinc	32
	Nickel Plate/Int'l Corona Corp.	1 184 935	Gold,Silver	183
5	Silvana/Treminco Resources Ltd.	21 790	Lead,Zinc,Silver	24
6	Sullivan/Cominco Ltd.	1 687 314	Lead,Zinc,Silver	694
8	Island Copper/BHP-Utah Mines Ltd.	18 464 874	Copper,Gold,Silver,Molybdenum	573
	Myra Falls/Westmin Resources Ltd.	1 081 400	Copper,Zinc,Gold,Silver	521
10	Gibraltar/Gibraltar Mines Ltd.	12 004 582	Copper,Gold,Silver,Molybdenum	306
13	Endako/Placer Dome Inc.	9 495 281	Molybdenum	241
15	*Afton/Afton Mines Ltd.	1 982 209	Copper,Gold,Silver	146
	**Similco/Princeton Mining Corp.	3 680 139	Copper,Gold,Silver	171
	Samatosum/Minnova Inc.	177 617	Lead,Zinc,Silver,Gold,Copper	76
TOTAL	**METAL AND ASBESTOS MINES**	**106 477 818**		**5 575**
8	Quinsam/Quinsam Coal Ltd.	275 880	Coal	50
9	Bullmoose/Teck Corp.	2 179 000	Coal	339
	Quintette/Denison Mines Ltd.	8 551 318	Coal	1 410
12	Balmer/Westar Mining Ltd.,	8 927 076	Coal	1 335
	Byron Creek/Esso Resources Ltd.,	1 535 723	Coal	191
	Fording/Fording Coal Ltd.,	9 586 837	Coal	1 014
	Greenhills/Westar Mining Ltd.,	4 037 646	Coal	638
	Line Creek/Crowsnest Res.Ltd.,	3 048 550	Coal	479
TOTAL	**COAL MINES**	**38 142 030**	**Coal**	**5 456**
TOTAL	**ALL MAJOR MINES**	**144 619 848**		**11 031**

* Mines closed at the end of December, 1991
** On Strike June 1 - October 14, 1991

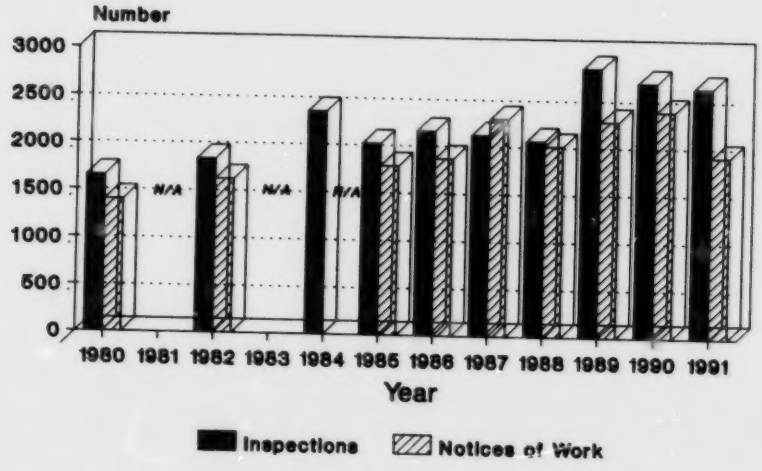
1.4.2. Volume of Inspections and Notices of Work

Inspections	Fernie	Kamloops	Nanaimo	Nelson	P.George	Smithers	Vic/Van	Total
Coal - Surface	80	0	16	0	14	0	18	128
Coal - U/G	0	0	9	0	2	0	2	13
Exploration - Surface	41	107	82	74	109	181	0	594
Exploration-U/G	0	7	4	12	0	2	0	25
Ind.Minerals - Surface	6	5	14	2	11	0	0	38
Ind.Minerals-U/G	3	0	0	1	0	0	19	23
Metal - Surface	3	47	10	2	31	40	39	172
Metal - U/G	22	5	19	5	2	39	11	103
Placer - Surface	61	57	37	9	429	104	2	699
Placer - U/G	0	3	0	0	7	0	0	10
Sand and Gravel	30	16	442	51	47	67	30	683
Quarries	0	4	70	3	0	0	8	85
Abandoned	0	1	14	1	4	4	0	24
Other	6	0	1	0	21	0	10	38
Total	252	252	718	160	677	437	139	2635

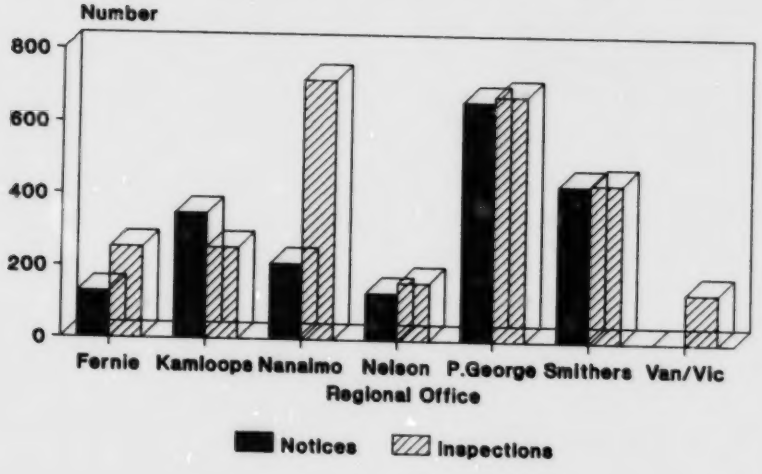
Notices of Work	**Fernie**	**Kamloops**	**Nanaimo**	**Nelson**	**P.George**	**Smither**	**Vic/Van**	**Total**
Coal - Surface	4	0	0	0	1	0	0	5
Coal - U/G	0	0	1	0	0	0	0	1
Explor. - Surface	78	225	123	88	256	349	0	1119
Exploration - U/G	0	4	0	10	0	3	0	17
Ind.Minerals-Sur	0	0	0	0	0	0	0	0
Ind.Minerals U/G	0	0	0	0	0	0	0	0
Metal - Surface	0	0	0	0	0	1	0	1
Metal - U/G	0	0	0	0	0	1	0	1
Placer - Surface	38	92	25	22	394	72	0	643
Placer - U/G	0	13	0	0	2	0	0	15
Sand and Gravel	9	6	41	11	8	7	0	82
Quarries	0	6	0	1	0	0	0	7
Abandoned	0	0	0	0	0	0	0	0
Other	0	0	19	0	1	0	0	20
Total	129	346	209	132	662	433	0	1911

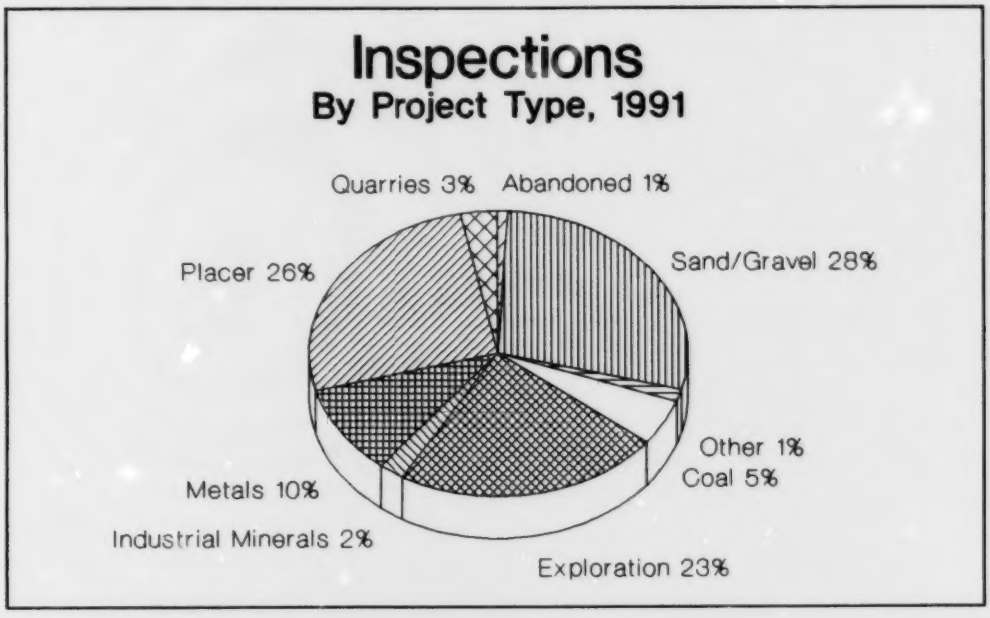
Note that the number of inspections or Notices of Work is not a good indicator of the relative volume of activity of each office. Some regions contain a few very large mining operations (such as the coal mines of the East Kootenays), whereas other areas contain hundreds of smaller operations (such as the sand and gravel operations of the Lower Mainland). The length of time it actually takes to conduct an inspection therefore varies from region to region.

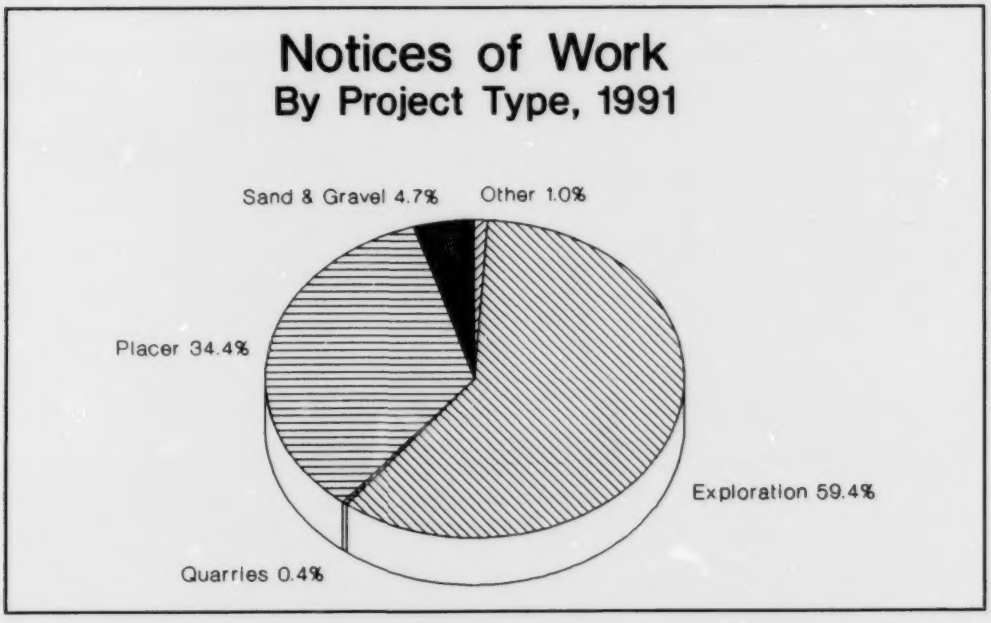
Inspections and Notices of Work Volume, 1980-1991



Inspections and Notices of Work by Regional Office, 1991




Inspections
By Project Type, 1991
Quarries 3%
Abandoned 1%
Placer 26%
Sand/Gravel 28%
Other 1%
Coal 5%
Metals 10%
Industrial Minerals 2%
Exploration 23%


Notices of Work
By Project Type, 1991
Sand & Gravel 4.7%
Other 1.0%
Placer 34.4%
Exploration 59.4%
Quarries 0.4%

1.4.3 Information Systems

Three reporting systems are in various stages of computerization:

- Notices of Work: The "NOTICES" program is the data entry utility for Notices and Completion Report information regarding placer, sand and gravel/quarry and mineral exploration. The system records and updates information concerning referrals, letters and approvals sent out, and special operating conditions set for each property. The Notice of Work form was being revised in 1991, and the system will be redeveloped with the main focus on streamlining the process to include completion details. When fully implemented, this system will allow regional offices to more closely monitor the level of activity at each operation.

- Mine Accident Reporting Database: The "MINACC" program is described in depth in *Section 6.3 Dangerous and Unusual Occurrences.*

- Staff Activity Listing: As most effort was focussed on the MINACC project in 1991, little work was performed on the "STARS" program. This program is designed to monitor and report the breakdown of activities in the Occupational Health, Environmental Impact Management and Administration sections.

A project in 1991 was the development of a program to generate questions for mine supervisor examinations. Previously when a supervisor requested to sit an examination, the Inspector would have to return to the office, compile an examination and return with it to the minesite at a later date. Now, through the use of laptops with the new software, the exam can be generated on-site and an examination conducted immediately. The questions are randomly selected by the computer for the appropriate type of supervisor, and the answers to each question are generated for the person marking the exam. Using this new software eliminates the cost of the Inspector for a trip to and from the minesite.

PART 2: BRANCH ADMINISTRATION

The Branch administrative mandate is to ensure that the personnel and financial resources of the Branch are managed for maximum efficiency and effectiveness.

2.1. BRANCH STAFFING LEVELS

The following table shows the staffing levels of the Resource Management Branch from 1981-1991. The numbers show full-time employees only and do not include auxiliary personnel. The staffing level in 1991 was 70.25.

2.2. BRANCH PERSONNEL

Mr. R.W. McGinn was the Chief Inspector of Mines and directed the Branch in 1991.

In February, the Branch announced its reorganization to focus the staff into two separate aspects of the mining industry. The **Occupational Health and Safety Group** (OHS) provides service to mine operators, mine unions and occupational health and safety committees and focusses its efforts on improved service quality in inspection and investigation functions and better liaison with other ministries. The **Environmental Impact Management Group** (EIM) strives to improve service quality through more timely and in-depth project reviews, approvals and permitting. In addition, the EIM Group addresses land use and public concerns.

Close public interest and involvement in new mine proposals, together with heightened public awareness and concern regarding mining activities, continued to demand more staff attention and improved liaison with federal and provincial government ministries and agencies and Native organizations.

In May, 1991 the name of the Branch changed from Engineering and Inspection to Resource Management.

Staff training through courses, seminars, conferences and annual meetings continued to be an important objective for the Branch. The Branch engaged a consultant late in the year to prepare competency profiles for all staff which would assist in targetting appropriate training,

During the greater part of 1991, the Branch continued to carry out its mandate without full staffing; however, by year-end three inspector positions had been filled. During the year, contract inspection work continued to assist in the fulfillment of the mandate. Co-op students from various educational institutions hired to work in regional offices and Victoria again enabled projects which otherwise could not have been undertaken due to the heavy work load of permanent staff.

The following Branch personnel are listed by office and position, with auxiliary positions indicated by the abbreviation (aux.)

Victoria:

Chief Inspector of Mines/Director	R.W. McGinn
Assistant Director, Environmental Impact Management	G. McKillop
Assistant Director, Occupational Health and Safety	R.A. Fyles
Manager, Branch Administration	L. Rennie
Manager, Development Review and Approvals	N. Ringstad
Manager, Geotechnical Engineering	vacant
Manager, Information Systems	B. McLaughlin/S. Collier
Manager, Mechanical/Electrical Engineering & Emergency Preparedness	T.G. Carter
Manager, Occupational Health & Industrial Hygiene	vacant
Manager, Reclamation and Permitting	J.C. Errington
Access Road Specialist	J.E. Brenner
Electrical Inspector of Mines	D.M. Edwards
Environmental Control Engineer	D.J. Murray
Emergency Preparedness Coordinator	R. Brow
Geotechnical Engineer	vacant
Information Systems Assistant	P. Reynolds
Mine Development Project Evaluation Coordinator	A. Currie
Mine Development Technical Assistant	B. Paul
Reclamation Engineer	D. M. Galbraith
Administrative Clerk	vacant
Records Supervisor	E. Seronik
Records Clerk	N. Selene
Secretary	V. Archer
Secretary	S. Ferguson
Secretary	C. Howell
Secretary	P. Knudson (aux)
Secretary	K. Sawrie
Office Assistant (aux)	S. Granger
Office Assistant (aux)	E. Titus
Office Assistant (aux)	M. Wiegler

Vancouver:	
Inspector of Mines - Environmental Control	R. Kumar
Inspector of Mines - Environmental Control	A. Parker
Fernie:	
District Inspector and Resident Engineer/Office Administrator	R. Booth
District Inspector and Resident Engineer	A. Whale
Inspector of Mines (Mine Rescue)	P. Switzer
Inspector of Mines (Mechanical)	G.A. MacDonald
Inspector of Mines (aux)	D. Roach
Inspector of Mines (aux)	J. Michell
Secretary	L. McIntyre
Office Assistant (half-time)	V. Smolik
Kamloops:	
District Inspector and Resident Engineer/Office Administrator	F.J.T. Hancock
District Inspector and Resident Engineer	E. Sadar
District Inspector and Resident Engineer	J.E. Beswick
Inspector of Mines (Mechanical)	R. Heistad
Inspector of Mines	H.P. Seguin
Secretary	L. MacCulloch
Office Assistant	J. Worsfold
Office Assistant (aux) (half-time)	L. Wilms
Nanaimo:	
District Inspector and Resident Engineer/Office Administrator	R. Bone
District Inspector and Resident Engineer	E. Beresford
Inspector of Mines	J.C. Alvarez
Secretary	G. Peachey
Office Assistant (aux)	K. McKay
Office Assistant (aux)	L. Quinn
Nelson:	
District Inspector of Mines/Office Administrator	M.A. Mellor
Inspector of Mines (Reclamation)	A.L. O'Bryan
Secretary	S. Beatty
Office Assistant (aux) (half-time)	S. Smith
Prince George:	
District Inspector and Resident Engineer/Office Administrator	D. Turner
District Inspector and Resident Engineer	S. Wuschke
District Inspector of Mines	J.J. Sutherland
District Inspector of Mines	D. Miller
Secretary	T. Burroughs
Office Assistant	N. Wood
Office Assistant (aux)	R. Legge
Office Assistant (aux) (part-time)	C. Scofield
Smithers:	
District Inspector and Resident Engineer/Office Administrator	D.W. Flynn
District Inspector and Resident Engineer	B. Good
Inspector of Mines (Reclamation)	E.J. Hall
Inspector of Mines	D. Porteous
Inspector of Mines	B. Graff
Inspector of Mines	E. Mehr
Secretary	E. Konschuh
Office Assistant (half-time)	G. Baker
Office Assistant (half-time)	E. Burchett
Office Assistant (aux)	G. Oliarny

2.3 STAFF CHANGES

The following staff changes occurred during 1991:

January:
Maria Wiegler in the Victoria office moved from auxiliary to regular status.

February, March, April: No changes.

May:
Sandra Smith joined the Nelson staff as an auxiliary office assistant.

June:
Val Smolik was converted from auxiliary to regular status.

July:
Greg McKillop accepted the position as Assistant Director, Environmental Impact Management.

August: No changes.

September:
- John Michell joined the Fernie office as an auxiliary Inspector of Mines.
- Inspector of Mines Harold Armour retired from the Nanaimo office after 16 years of service.
- Eugene Mehr joined the Smithers office as Inspector of Mines.
- Glen Oliarny joined the Smithers office as an auxiliary office assistant after completing a term as a student.
- Sue Granger was hired as an auxiliary office assistant and receptionist in the Victoria office.
- Carmel Scofield joined the Prince George office as an auxiliary office assistant while continuing her studies.

October:
- Kathy McKay left the Nanaimo office.
- Lise Quinn in the Nanaimo office moved from auxiliary to regular status.
- Inspector of Mines David Porteous retired from the Smithers office after two years.
- Penny Reynolds was hired as the Information Systems Assistant in the Victoria office.
- John Michell joined the Fernie office staff as an auxiliary Inspector of Mines.
- Norm Ringstad, Anne Currie, Bob Paul and Susan Ferguson left the Resource Management Branch to form the Mine Development Assessment Branch.
- Trudy Burroughs commenced arrangements to transfer to Nanaimo effective January 1, 1992.
- Belinda McLaughlin left the Branch to become the Employment Equity Advisor for the Ministry.

November:
- Bruce Graff joined the Smithers office as an Inspector of Mines.
- Eveyln Titus was hired as an auxiliary office assistant in the Victoria office.
- Sophia Collier joined the Branch as Manager, Information Systems.

December:
- Renae Legge was hired as an auxiliary office assistant in the Prince George office.
- Nancy Wood successfully competed for the position of secretary in Prince George effective January 1, 1992.

2.4. BRANCH BUDGET

Resource Management Branch
Budget 1981–1991

Year	Budget (Millions Actual $)
1981	2.68
1982	3.29
1983	2.76
1984	3.35
1985	3.38
1986	3.53
1987	3.46
1988	3.71
1989	3.93
1990	4.58
1991	5.93

PART 3. DEVELOPMENT REVIEW AND APPROVALS

3.1 RECLAMATION

Roles and Responsibilities

In British Columbia, environmental protection and reclamation is a major component of all mineral exploration and mine development activity. Since 1969 mining companies have been required by law to reclaim all lands disturbed by mining. B.C. was one of the first jurisdictions in Canada to enact mine reclamation legislation, and the first to extend this policy to exploration sites. Mining companies are also required to obtain a reclamation permit and place a security deposit with the Province. These deposits are held until reclamation is completed.

The duties of the Reclamation Section include:

- review and issue mine reclamation permits;
- inspection of reclamation at mines;
- administration of reclamation security deposits on behalf of the provincial government; and
- participation in selected committees and activities to enhance mine reclamation in the province, including the Technical and Research Committee on Reclamation, the British Columbia Acid Mine Drainage Task Force, and the national Mine Environment Neutral Drainage committee.

Structure and Organization

The Reclamation Section is comprised of five personnel: the Manager, Reclamation Engineer and a Co-op student, based in Victoria; and two Reclamation Inspectors, one based in Nelson and one in Smithers.

The Section works closely with industry and other members of government to ensure that all concerns are addressed. For reclamation permits involving more than minimal surface disturbance applications are referred to other government agencies for input. In this way, environmental issues are dealt with before they arise.

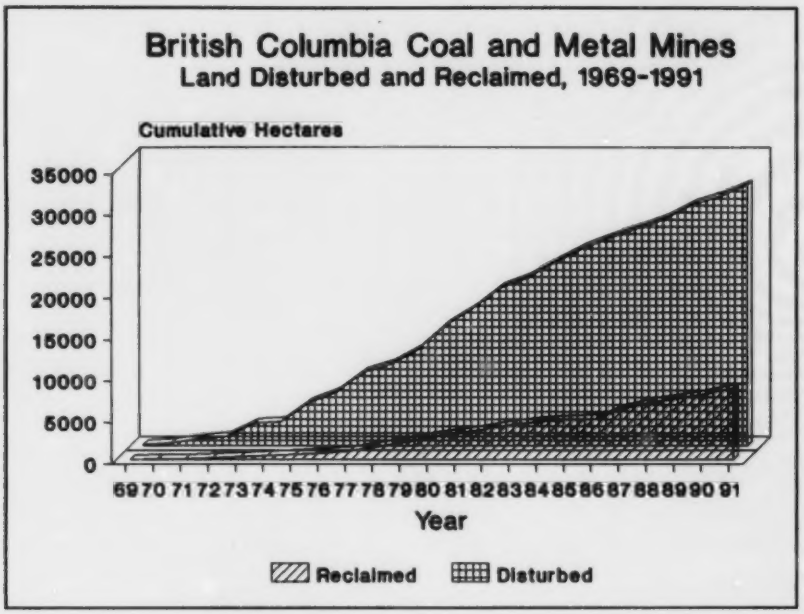
Cooperation between industry, government, and the academic community through research committees ensures information exchange and dissemination of new technology.

Summary of Activities

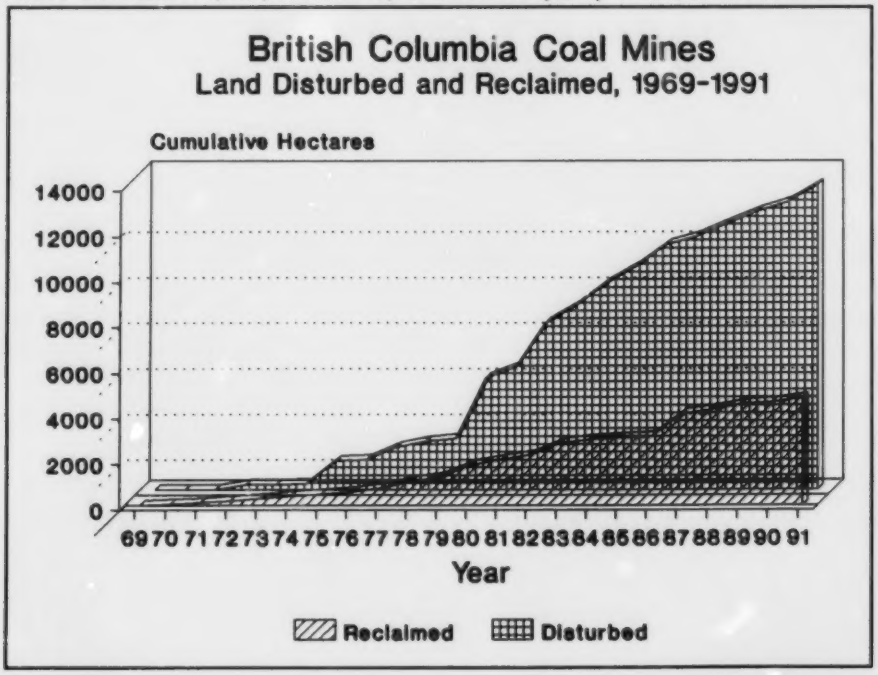
The mining industry in British Columbia currently consists of large-scale open pit mines which have developed since the late 1960s replacing small underground operations. This evolution has meant a corresponding increase in surface disturbance. Major coal and metal mines now cover a total of 31,650 hectares, compared to less than 200 hectares in the late 1960's. Of this 31,650 hectares, 27 per cent (8,633 hectares) has been reclaimed, leaving a balance of 23,017 hectares of disturbed land.

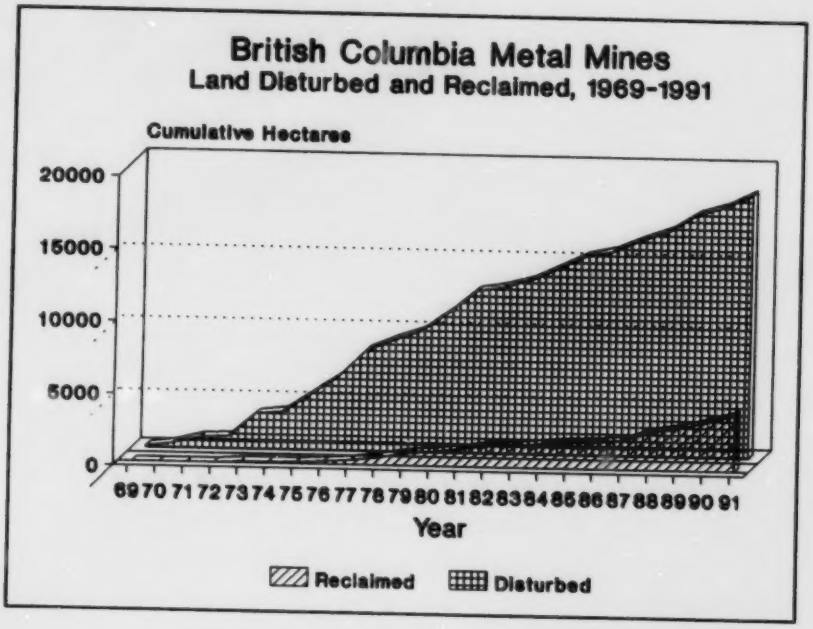
Mining Land Disturbance and Reclamation as of December 31, 1991 (Cumulative Hectares)

Type of Mine	Area Disturbed	Area Reclaimed
Coal Mine	13,390	4,696
Metal Mine	18,260	3,937
Total	31,650	8,633



The following two graphs show the separate breakdown of disturbed and reclaimed land at coal and metal mines. Coal mines have disturbed 13,390 hectares, 35 per cent of which (4,696 ha) has been reclaimed. Metal mines have disturbed 18,260, of which 3,937 hectares (22%) have been reclaimed.





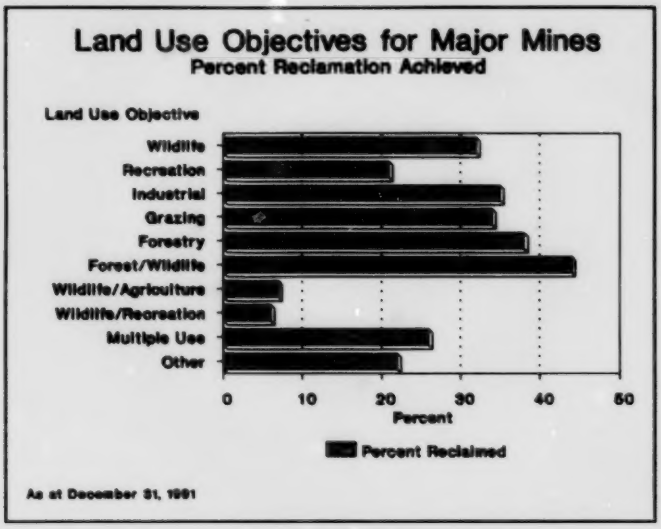
The higher percentage of land reclaimed at coal mines partly reflects the different mining conditions. Most metal mine ore deposits are contained in single pits which continually expand as mining proceeds. Coal seams, on the other hand, are usually relatively shallow stratabound deposits which can be mined and immediately backfilled and reclaimed, allowing more rapid reclamation success.

The Reclamation Section has also initiated two new information systems. The first stores data on the nature and quantity of waste rock and tailings and the second stores information on end land use objectives.

The waste database will allow the Section to accurately assess the amount of acid generating or potentially acid generating waste material in the province. At present, there is not enough data to accurately portray present conditions. The land use database system compiles end land use objectives for all major mines. The following table and chart depict reclamation land use objectives for major mines:

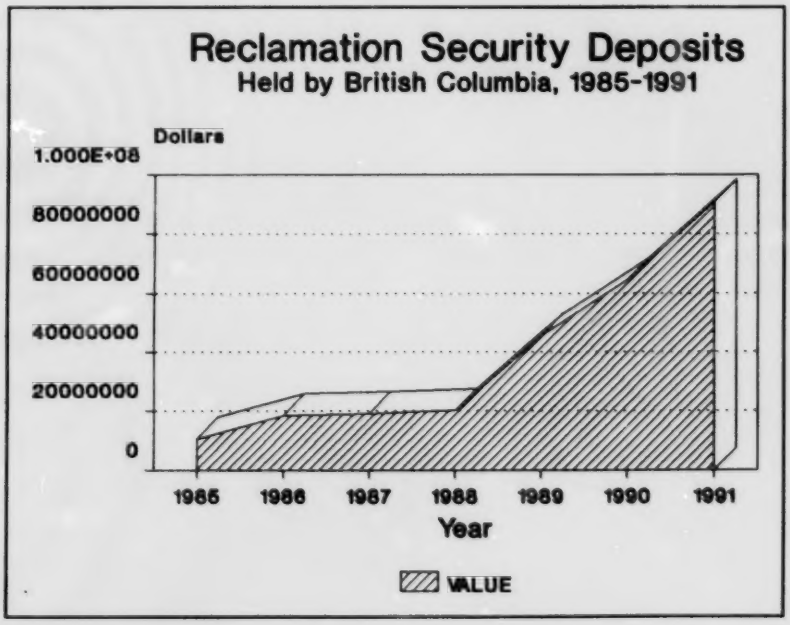
Land Use Objectives for Major Mines - Per Cent Reclamation Achieved as at December 31, 1991

Land Use Objective	Disturbance (Hectares)	Reclamation (Hectares)	Percent Reclaimed
Wildlife	6016	1953	32
Recreation	24	5	21
Industrial	118	41	35
Grazing	849	285	34
Forestry	58	22	38
Forest/Wildlife	3226	1415	44
Wildlife/Agriculture	1415	105	7
Wildlife/Recreation	1655	94	6
Multiple Use	5862	1494	26
Other	894	192	22



Reclamation Securities and Funds

In accordance with the Mines Act (1989) reclamation security bonds should be sufficient to provide for the costs required to perform all outstanding reclamation. The Reclamation Section is working towards this goal, and the recent increase in the amount of security held by the Province is an indication of the success achieved to date.



Both government and industry recognize the large financial implications of long-term treatment of acid mine drainage. The Mines Act provides for the establishment of mine specific Reclamation Funds which can be established during mine operations to finance the long-term treatment costs associated with acid mine drainage.

Reclamation Section Highlights

The Ministry believes that improved public access to information, greater public involvement in decision making processes and improved regulations will achieve the success of environmental protection programs in the Province. A number of initiatives were completed during 1991:

- o Publication of Reclamation Policy overview.
- o Protocol agreements with Ministry of Environment on bonding and Rock Drains.
- o Successful agreement with Equity Silver for placement of $37.5 million security. Thirty-two million for long-term treatment of acid mine drainage, and $5.5 million for till cover and decommissioning costs.
- o Formation of a Public Liaison Committee in Kimberley to oversee the decommissioning and reclamation of the Sullivan Mine.
- o Continued to work with the public surveillance committees established for review of Brenda Mines and Equity Silver mines closure plans.
- o Continued reclamation work on the Mount Washington site achieving cleanup and improved water quality of approximately fifty percent of the pit area.

Research Committees/Activities

Technical and Research Committee on Reclamation:

This committee has been active in promoting and fostering reclamation research for over seventeen years. Members are drawn from the Ministry of Energy, Mines and Petroleum Resources, the Ministry of Environment, Environment Canada, mining companies, The Mining Association of British Columbia, and the Coal Association of Canada. This committee has been responsible for the organization of the annual B.C. Mine Reclamation Symposium for the past fifteen years.

Mine Reclamation Symposium

The Fifteenth annual B.C. Mine Reclamation Symposium was held June 24-28, 1991 at Kamloops, British Columbia. During the symposium awards and citations were presented honouring outstanding achievements in mine reclamation. The Annual B.C. Mine Reclamation Award was presented to Brenda Mines. Citations were also presented to Polestar Exploration Inc. for exploration reclamation; Total Energold Corporation for metal mine reclamation; Westar Mining Ltd. for coal mine reclamation; Preido Mines for placer mine reclamation; and to Butler Bros. Ltd. for sand and gravel reclamation.

Mount Washington Reclamation Program

The Ministry has taken over reclamation of the abandoned Mount Washington mine site, with the main concern being to control the acidic drainage issuing from the site. This project forms a part of the research coordinated by the British Columbia Acid Mine Drainage Task Force. Mount Washington serves as a testing ground for many different mitigative techniques. To date a number of cover materials have been tested, a diversion ditch has been constructed, and monitoring instruments have been installed. Results from monitoring programs scheduled for 1992 will determine the success of the various techniques.

3.2 ACID MINE DRAINAGE INITIATIVES IN BRITISH COLUMBIA

Acid mine drainage (AMD) is the largest single environmental problem facing the Canadian mining industry today and British Columbia is no exception. There are several groups in the country coordinating research into possible solutions. Although a national committee was founded in 1986 to study acidic tailings, British Columbia was the first province to form a committee to research AMD with an emphasis on waste rock.

Since the formation of the British Columbia Acid Mine Drainage (BCAMD) Task Force in 1987, a second national committee (Mine Environment Neutral Drainage (MEND)) and several other provincial committees have been formed.

The BCAMD Task Force draws its members from provincial and federal government agencies, the Mining Association of B.C., the B.C. and Yukon Chamber of Mines, and the mining industry. The purpose of the Task Force is to coordinate research into AMD by providing funding, direction, or by disseminating information.

In British Columbia considerable attention is focused on the prediction and prevention of acid mine drainage before a new mine proposal is approved under the Mine Development Review Process. The review process which has recently been legislated under the Mine Development Assessment Act, is a comprehensive review and approval system for new mine projects in the province. All proposed mines are expected to conduct thorough studies to demonstrate that acid mine drainage problems can be managed by technically sound and economically affordable means prior to mine construction. Laboratory techniques to predict acidic drainage were developed in British Columbia in the early 1970s and have been used extensively and further refined since that time.

In 1991, along with the publication of its 1990/91 annual report, the BCAMD Task Force published four project reports. The reports have been distributed widely to mining companies, consultants, regulatory agencies, universities, and public interest groups. All reports are available from BiTech Publishers Ltd. (#903 - 580 Hornby Street, Vancouver, B.C. V6C 3B6).

Reports currently available from BiTech include the following:

- Acid Mine Drainage From Mine Walls: The Main Zone Pit at Equity Silver Mines
- Acid Mine Drainage Project: Review and Assessment Study
- A Preliminary Biological and Geochemical Assessment of Subaqueous Tailings Disposal in Benson Lake, British Columbia
- Geochemical Assessment of Subaqueous Tailings Disposal in Buttle Lake, British Columbia
- Hydrogeological Assessment and Development of AMD Control Technology for Myra Falls Waste Rock

- Kutcho Creek Project Acid Generation Testwork, Phase II
- Literature Review for Biological Monitoring of Heavy Metals in Aquatic Environments
- Monitoring Acid Mine Drainage
- Draft Acid Rock Drainage Technical Guide
- Review of Sediment Monitoring Techniques
- Shotcrete Application of Cementitious Sealant Materials for Acid Rock Drainage Control
- The Effect of Treated Acid Mine Drainage of Stream Macroinvertebrates and Periphytic Algae: An In Situ Mesocosm Experiment

The Task Force spent a little over $800,000.00 during 1991. Funding was supplied by the provincial and federal governments through the Mineral Development Agreement, Environment Canada, Ministry of Energy, Mines and Petroleum Resources, the mining industry, the Norwegian government, and by a private contribution from Noranda Minerals Inc.

In 1991, the Task Force continued to support nine ongoing projects and coordinated the start up of 10 new projects. The nineteen projects included:

- Compilation of AMD Prediction Data
- Compilation of AMD Prediction Rules
- Cinola Gold Project Kinetic Tests
- Waste Rock Modelling
- Abandoned Mines Survey
- Submarine Disposal
- Blending and Segregation (Kutcho Creek Project)
- Samatosum AMD Project
- Mount Washington Evaluation
- In-Situ Treatment of Waste Dumps
- Constructed Wetlands (Bell Mine)
- Use of Zeolites to Neutralize Drainage
- Norwegian Remediation Study
- Aquatic Invertebrate Monitoring
- Paleolimnological Techniques
- Ion Speciation Model
- Field Sampling Quality Assurance/Quality Control
- Monitoring Goals Workshop

3.3 GEOTECHNICAL

Role and Responsibilities

The duties of the Geotechnical Section include:
- The inspection of major geotechnical works at mines.
- The assessment of geotechnical engineering designs.
- The regulation of geotechnical aspects of mining operations.

The Section provides in-house technical expertise and policy advice with respect to:
- Open cut and underground rock mechanics.
- Large soil structures such as mined rock and overburden dumps and tailings impoundments.
- Off site mine access roads, including route selection, standards and construction.
- Risk evaluation and environmental impact of geotechnical projects.

Organization

During 1991 the Branch continued to rely on a consultant for geotechnical expertise, while searching for a qualified geotechnical engineer to fill the position of Geotechnical Manager. The successful candidate joined the ministry in early 1992.

Geotechnical issues regarding roads are handled by the Branch's roads geotechnician and roads activity is reported under Section 3.4.

The Branch's intention is to be in a position by 1992 to address all geotechnical issues in-house with a staff of two geotechnical engineers and one technician.

Section Activities

Geotechnical Consultant:

The consultant was called upon to address dangerous geotechnical incidents and various technical projects. Worthy of note are:

- The failure of a dyke during the construction of an additional lift at Sullivan Mine.
- Geotechnical submissions regarding spoil piles from the northeast and southeast coal mines.
- Geotechnical review of underground development at Cassiar Mine.
- Geotechnical design and environmental assessment of large sand and gravel pits near populated areas.

Mine Waste Rock Pile Research Committee:

The Mine Waste Rock Pile Research Committee continued to foster research work toward a common understanding of mined rock and overburden piles under the direction of chairman Ralph McGinn.

Reports on the first two studies in a series undertaken by the committee were published in May 1991 and three more documents are scheduled to go to press in early 1992. The five printed and proposed documents include:

Interim Guidelines

Investigation and Design Manual	(1991)
Operating and Monitoring Manual	(1991)

Interim Reports

Methods of Monitoring	(1992)
Failure Runout Characteristics, Volumes I and II	(1992)
Review and Evaluation of Failures	(1992)

The series of studies is directed at improving our understanding of mined rock and overburden piles and developing a consistent geotechnical database for such. Prominent geotechnical consultants and industry representatives have contributed their expertise to the studies.

Mine Dumps Workshops

A series of workshops relating to mined rock and overburden piles is scheduled for the spring of 1992. The workshops are timed to allow industry time to review and apply the Interim Guidelines for one year prior to providing their critique, and also to provide a preliminary review of the 1992 interim reports.

The workshops are intended to provide a forum for participants to discuss and comment on the various interim studies. In particular the workshops are part of an ongoing process to validate, modify and update the Interim Guidelines to a standard for sound geotechnical and economic investigation, design, operation, and monitoring of mined rock and overburden piles while safeguarding mine personnel, infrastructure, the public and environment. It is anticipated that the workshops will generate much useful input and awareness.

3.4. MINING ROADS

Role and Responsibilities

Under the authority of the *Ministry of Energy, Mines and Petroleum Resources Act*, this Section operates the Mining and Petroleum Road Program to encourage and assist in the development of mineral resources in the province. The Resource Management Branch Road Program Section is staffed by one Certified Engineering Technician (Civil). Administrative responsibility for this section in 1991 was under the Assistant Director, Environmental Impact Management, Resource Management Branch.

In 1991, the Ministry of Energy, Mines and Petroleum Resources, Resource Management Branch continued to provide technical expertise and advice on shared-cost assistance and loan agreements for road access studies and mine road construction to potential new mining sites.

In 1991, this Section participated in providing review comments, technical advice, terms of reference, contract documents and field inspections of proposed and completed mine access roads. Assistance was also provided to headquarters and district staff for road and pit stability on placer properties, review and recommendations for contracting of road access studies, and standards for haul roads on placer mining properties. A request from the Northwest Territories was received for mine road access information to be used as a guide line in the development of road standards in that part of Canada.

In addition to the above programs, the Section participated in the following projects:

1. The section was very active in answering queries on **old mining roads**, supplying information to government ministries (MOF, MOE, MOP, MEMPR headquarters and district offices) and the general public. Research continued on mining road liability and responsibility which is still of concern to ministries dealing with access throughout the province of B.C. During 1991, meetings and discussions were attended concerning resource roads with: the Ministry of Transportation and Highways, Ministry of Forests, Ministry of Solicitor General, Ministry of Agriculture and Foods, and the Royal Canadian Mounted Police.

2. The status of the **Omineca Mine Road** from the Mesilinka River Bridge to Moose Valley involved considerable discussion with Cheni Gold Mines and the Ministry of Transportation and Highways, regarding the resistibility and standard of maintenance required.

3. **Golden Bear Operating Company Mine Road Access**: During the summer of 1991, the Ministry of Forests requested assistance from the Road Section for the preparation of maintenance estimates for inclusion in the "Special Use Permit" and "Abandonment Plan" for this road access. A field trip was required to assess the present road condition and the estimates were prepared and submitted.

   The District Inspector responsible for this area requested assistance in checking haul road design and standards for access on the mine site to the open pit workings.

4. **Windy Craggy Road Access**: At the request of the Mine Development Review Committee, environmental comments were reviewed and discussed with the Committee.

5. **Iskut Mine Road Access** – a distance of approximately 100 km (76 km from Bob Quinn Lake to Bronson Creek, and 24 km from Volcano Creek to the Eskay Creek property): During 1991 review was completed of the Klohn Leonoff Ltd. report on the survey, design and costing of this project. Construction costs were considerably higher than expected, and as a result, some extensive review of the plans, profiles, cross-sections, quantities and cost estimates was initiated to determine the viability of the Klohn Leonoff Ltd. submission. The Ministry of Forests' Engineering Section, Smithers; Corona Corporation Inc.'s engineers, Vancouver; and the Road Program Section determined that the proposed access could be constructed in accordance with the terms of reference and at a much lower cost.

   Subsequently, MEMPR Mineral Policy Branch negotiated a loan agreement with Prime Resources (a division of Corona Corporation Inc.) for the construction of the first 36 km of the mine road, which was completed in 1991 from Bob Quinn Lake to approximately 1 km beyond Volcano Creek. MEMPR Resource Management Branch finalized the road alignment; provided road construction standards; assisted Prime Resources with contract preparation; attended pre-tendering meetings with contractors; and assisted the Ministry of Forests in preparing the Special use Permit and establishing a reasonable bond amount for construction of this project.

   At the request of MEMPR Mineral Policy Branch, the State of Alaska report was reviewed and comments on various access alternatives into this area were submitted.

6. The Roads Section continued the task of redrafting the **Regional Placer Co-ordinating Committee Procedures Manual** for the Mine Development Regional Review Committees' use as a guide in addressing placer issues. As a result of changing legislation and procedures for resolving contentious issues, work on the revision will continue into 1992.

7. A request for information on British Columbia **placer permitting and operation** was received from the Northwest Territories. The NWT plans to use the information to develop guidelines for coping with an anticipated increase in placer mining activity in that area of Canada.

3.5. MINE DEVELOPMENT REVIEW PROCESS

The Mine Development Approval Process (MDAP) is a review procedure for new mining ventures, which is sponsored and administered by the Province of British Columbia and driven by the working policy of the Cabinet Committee on Sustainable Development. The process is applied to coal and hardrock mineral mines, and includes new mines, major expansions, and large pilot projects. It does not apply to bulk samples less than 10,000 tonnes, placer, and sand and gravel operations.

The goal of the MDAP is to integrate environmental management with economic development by facilitating and expediting technically sound and environmentally acceptable mining ventures.

The lead agency for the MDAP, the Ministry of Energy, Mines and Petroleum Resources, chairs the Mine Development Steering Committee (MDSC) and all Regional Mine Development Review Committees (RMDRCs), and provides both administrative and technical support to these committees.

The MDSC is responsible for coordinating the review of mine developments. Committee members include senior staff from: the Ministry of Energy, Mines and Petroleum Resources; B.C. Environment; the Ministry of Transportation and Highways; the Development Services Branch of the Ministry of Municipal Affairs, Recreation and Culture; the Archaeology Branch of the Ministry of Municipal Affairs, Recreation and Culture; the Ministry of Native Affairs; the Ministry of Economic and Regional Development; and Environment Canada.

The MDSC may delegate reviews of small and relatively simple projects to one of six RMDRCs for local handling by regional permitting staff. These committees are based in:

- Smithers (Northwest Mine Development Review Committee);
- Prince George (Northeast Mine Development Review Committee);
- Kamloops (Southcentral Mine Development Review Committee);
- Fernie/Nelson (Kootenay Mine Development Review Committee);
- Nanaimo (Vancouver Island Mine Development Review Committee);
- Vancouver (Lower Mainland Mine Development Review Committee).

Committee members include technical staff from: the Ministry of Energy Mines and Petroleum Resources; B.C. Environment; the Ministry of Forests; the Ministry of Crown Lands; Environment Canada; and Fisheries and Oceans Canada.

In July 1990, the Province of British Columbia introduced the *Mine Development Assessment Act* which formalized the MDAP. This legislation was considered necessary to:

- demonstrate the province's commitment to thorough environmental assessments for all significant mine developments in British Columbia; and

- establish a legal basis for public participation in the review process by upgrading the provisions for public consultation.

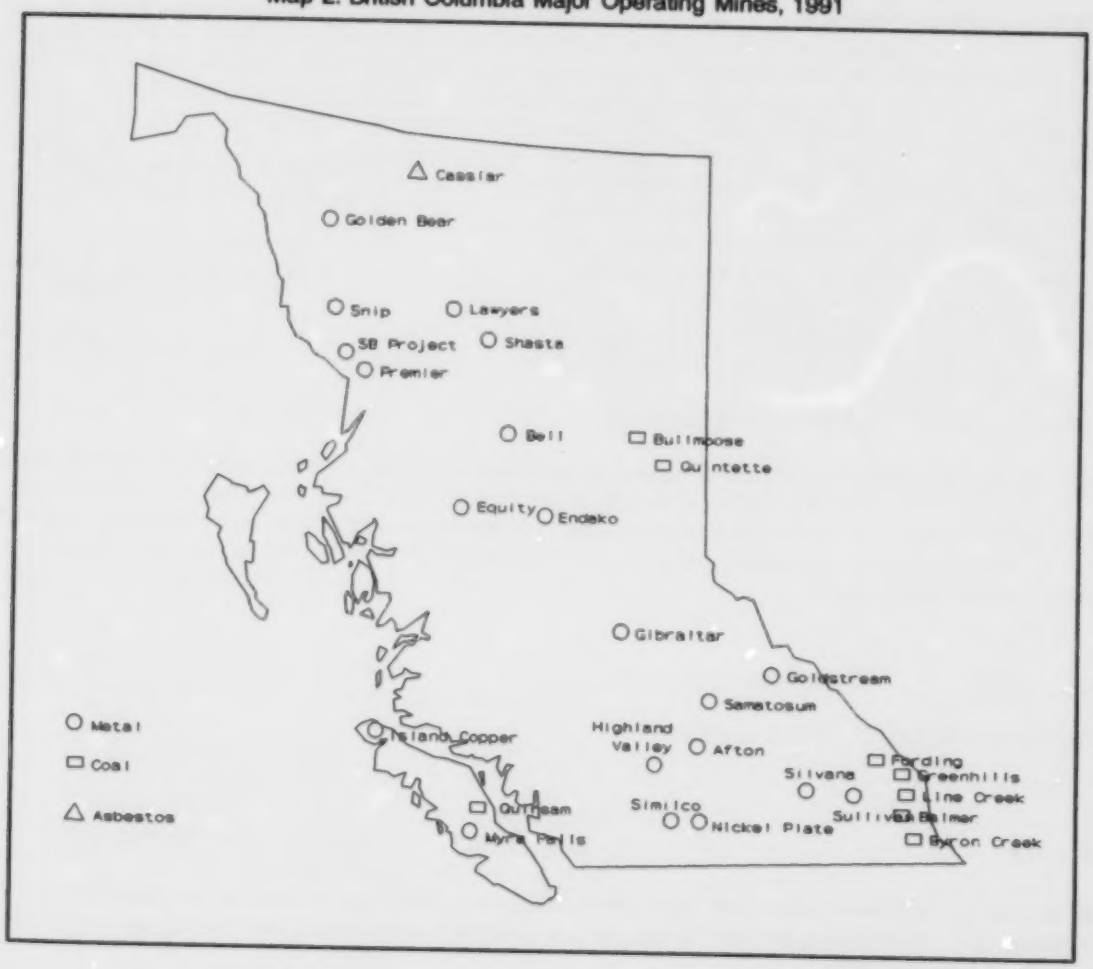
The *Mine Development Assessment Act* was proclaimed in 1991. At that time, responsibility for administration of the Act was shifted from Resource Management Branch to the new Mine Development Assessment Branch. 1991 participation in major MDAP projects is described in the regional office reports which follow.

PART 4: INSPECTION SERVICES

Mining Inspectors monitor mining activity for adherence to mining legislation and operating permits. Contract Inspectors may also be used for inspecting small, low-impact projects.

Mines are inspected and monitored during all phases of activity from exploration through development, construction, operation, closure and abandonment. The following map shows the location of the major operating mines in British Columbia, whose operations in 1991 are individually described in the following reports of the Resource Management Branch regional offices.

Map 2. British Columbia Major Operating Mines, 1991



4.1. FERNIE REGIONAL OFFICE

4.1.1. Office Address(es)

Main Office:
Bag 1000, Fernie, B.C., V0B 1M0.
Tel: (604) 423-6884 Fax: (604) 423-3194

Satellite Office:
100 Cranbrook Street North, Cranbrook, B.C., V1C 3P9
Tel: (604) 426-1557 Fax: (604) 426-1253

4.1.2. Office Personnel

During the year, office personnel included:

R. Booth	District Inspector and Resident Engineer/Office Administrator
A. Whale	District Inspector and Resident Engineer
P.J. Switzer	Inspector of Mines/Rescue Co-ordinator
G. MacDonald	Inspector of Mines - Mechanical
D. Roach	Inspector of Mines (auxiliary)
J. Michell	Inspector of Mines (auxiliary)
L. McIntyre	Secretary
V. Smolik	Office Assistant

4.1.3. Area of Responsibility

The Kootenay Region is currently administered by two separate offices, one in Fernie and one in Nelson. The Fernie Regional Office is responsible for Inspection Districts #6 and #12 (see Map 1) in the southeast corner of the province. Andrew Whale is responsible for District #6 and R. Booth is responsible for District #12. A satellite office in Cranbrook services the client group for mineral and placer properties in the western portion of the region.

4.1.4. Inspection District #6

OPERATING METAL OR COAL MINES:

SULLIVAN

Lat 49°45' Long.116°00' (82F/9E; 82G/12W)

The Sullivan underground zinc, lead, silver mine and concentrator are located within the city limits of Kimberley, B.C. The mine is on Mark Creek, 3.2 km north of the city centre, and the concentrator is 3.2 km south of the city centre.

The operation is owned by Cominco Ltd., 200 Granville Street, Vancouver, B.C., V6C 2R2.

The Sullivan orebody lies in the Purcell Mountains between elevations of 2400–4300' above sea level. It is roughly semi-circular, measuring 7000' in diameter. The orebody lies on the east limb of a north plunging anticline with a 30o average dip, which is gentle in the upper part of the mine, steeper through the central portion and flatter along the eastern edge. Orebody thickness varies from a few feet to 300'.

The deposit is interpreted as a hydrothermal synsedimentary occurrence created in a marine subbasin of lower Proterozoic age in the Aldridge Formation. It has a basal layer of massive pyrrhotite overlain by layered sulphides containing pyrrhotite, sphalerite, galena and pyrite with minor clastic sediments. Chalcopyrite, tetrahedrite, arsenopyrite and cassiterite are also observed in small amounts.

This zinc, lead, silver mine commenced production in 1923. The operation has both underground and open-pit mining; however, the open pit has been inactive since 1983. Ore production is mainly from pillar recovery operations, with ore extraction from slusher sublevels or mechanized drawpoints.

The Sullivan mine has an estimated life expectancy of about ten years at the planned annual production rate of 1.73 million tonnes of ore. Cominco expects to operate at the current staffing levels of about 675 until close to the end of mine life when an expected small drop in manpower will be absorbed by attrition.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources *Mining in British Columbia*, Vol.1, 1975–1980, pp.5–6. 1981–1985, p.5; 1986–1987, p.48–49; 1988, p.45.
_____. *Annual Report, Engineering & Inspection Branch*, 1989, p.26; 1990, p.27.
_____. *Mineral Market Updates*, Vol.2 Nos.1–4, 1990.
Canadian Mining Journal, June 1989, p.69.
Minfile 82F/NE-52.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

NAME: Lussier River
TYPE: Open Pit
PRODUCT(S): Gypsum
LOCATION: 50°02'N 115°31'W
OWNER(S): Domtar Construction Materials Inc.

NAME: Nicholson
TYPE: Open Pit
PRODUCT(S): Silica
LOCATION: 51°11'N 116°52'W
OWNER(S): Bert Miller Trucking & Contracting

NAME: Mount Moberley
TYPE: Open Pit
PRODUCT(S): Silica
LOCATION: 51°22'N 116°58'W
OWNER(S): Mountain Minerals Co. Ltd.

NAME: Mount Brussilof Mine
TYPE: Open Pit
PRODUCT(S): Magnesite
LOCATION: 50°47'N 115°41'W
OWNER(S): Baymag Mines Co. Ltd.

NAME: Parson Barite
TYPE: Underground
PRODUCT(S): Barite
LOCATION: 50°01'N, 116°00'W

NAME: Windermere Operations
TYPE: Open Pit
PRODUCT(S): Gypsum
LOCATION: 50°29'N 115°52'W
OWNER(S): Westroc Industries Ltd.

NON-OPERATING MINES/MINE CLOSURES:
There were no permanent mine closures during the year.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Mt. Mahon	Zinc	49°08'N, 115°55'W	Minnova	Surface Diamond Drilling Program
Stoney	Zinc	49°10'N, 115°55'W	Minnova	Surface Diamond Drilling Program
LaPoint Creek	Gold, Silver, Lead, Zinc	49°45'N,116°37'W	Bapty Research	Surface Diamond Drilling Program
Bar Claims	Gold, Silver Lead, Zinc	49°28'N,115°55'W	White Knight	Trenching Program
Foyston No. 1	Decorative Stone	50°07'N, 115°50'W	Max Helmer Construction	Trenching Program
Vulcan	Lead, Zinc, Silver	49°47'N,116°20'W	Ascot Resources	Surface Diamond Drill Program
Paul-Mike	Lead, Zinc, Silver	49°46'N,115°41'W	DiaMet Minerals	Surface Diamond Drill Program
M.L.69	Lead, Zinc, Gold, Silver	49°30'N, 115°30'W	R.H. Stanfield	Rotary Percussion Diamond Drill
Elkhorn Barite	Barite	50°17'N, 115°45'W	Dynamic Drilling	Surface Diamond Drilling
Swansea Ridge	Railroad Ballast	49°24'N, 115°52'W	CP Rail	Extensive Surface Drilling-Trenching
David/Lew	Lead, Zinc, Gold	49°17'N, 116°08'W	Bapty Research	Surface Drilling Trenching

Name of Project	Type of Project	Location	Name of Company	Activity
Canam	Lead, Zinc, Gold	49°30'N, 116°00'W	Cominco (Kootenay Explorations)	Surface Diamond Drilling
Estella	Lead, Zinc, Gold	49°46'N, 115°36'W	Cominco (Kootenay Explorations)	Surface Diamond Drilling
Star	Lead, Zinc, Gold, Silver	49°12'N, 116°15'W	Kokanee Exploration	Surface Diamond Drilling
Sullivan	Lead, Zinc, Silver	49°45'N, 116°00'W	Cominco (Kootenay Explorations)	Surface Diamond Drilling
Darlin	Lead,Zinc,Silver	49°36'N, 116°02'W	Kokanee Exploration	Surface Diamond Drilling

4.1.5. Inspection District #12

OPERATING METAL OR COAL MINES:

Lat.49°45'

BALMER

Long.114°45'

(82G/16W)

The Balmer open pit coal operations are located on Harmer Ridge, five km southeast of Sparwood, B.C. The preparation plant is located in the Elk Valley, three km from Sparwood.

The mine is owned by Westar Mining Ltd., 1900–1176 West Georgia Street, Vancouver, B.C., V6E 4B9. The mine office address is P.O. Box 2000, Sparwood, B.C., V0B 2G0.

The Balmer operations are located on a syncline at the north end of the Fernie Basin. The area is underlain by the Kootenay Formation which is a series of interbedded sandstones, mudstones, siltstones, shales, conglomerates and coal seams up to 665 metres in thickness. In the area of the mine up to 18 metallurgical coal seams are evident. The seams generally dip at 15–20o and are disturbed by numerous thrust faults.

This is the largest open pit coal mine in the world, with production in the area dating back to the turn of the century. Mining is by open pit, truck and shovel methods on 15 metre benches; product is a low volatile bituminous coal. After treatment in the Elkview preparation plant, the coal is hauled to the Roberts Bank terminal in unit trains. The majority of metallurgical coal produced from the Balmer mine is sold to nine Japanese corporations under an agreement expiring on March 31, 1993. Metallurgical coal is also sold to Pohang Iron and Steel Company Ltd. of Korea under long term–contracts extending through March 31, 1994, and to steel mills in 20 other countries throughout the world. Thermal coal is used primarily as a fuel for electrical power generation and other industrial purposes. The company's thermal coal is sold to customers around the world.

Until 1988, operations at Balmer relied upon one main seam of coal for as much as 80% of the total raw coal produced. Today the total raw coal is derived from many seams and the main seam contributes only approximately 45% of the total base product. Because of the upper seam geology being encountered at Balmer, there is a greater quantity of waste material to be removed per clean tonne of coal produced.

Clean-strip ratio rose from 5.6 in 1989 to 6.1 in 1990, and to 7.5 in 1991. The yield of clean coal produced from raw coal improved to 61% in 1991 from 57% in 1990. As a result of the above factors, coal production at Balmer decreased 4% in 1991 to 5.4 million tonnes compared to 5.6 million tonnes in 1990.

In 1989 the company recognized that the fleets of rock moving equipment at Balmer were beyond their economic life and no longer well matched to the mine's geology. Accordingly, a replacement program was initiated, aimed at achieving substantial productivity and unit cost improvements over a five-year period. During 1991, the company acquired twelve new Haulpak 240-ton trucks for the Balmer operation.

In 1991, a long range plan was completed for both the Balmer and Greenhills Mines. The study concluded that with respect to Balmer, an expenditure of some $75 million over a five-year period was necessary to rehabilitate the mine. The proposed pre-stripping plan requires a new operating permit from the Provincial Government.

Westar reported accepting a lower price from the Japanese steel mills for the coming fiscal year, with the price of metallurgical coal dropping $0.50/tonne to US $51.30 on April 1, 1992. However, the Japanese steel industry has agreed to increase the tonnage it buys from Westar during 1992.

At Balmer, three-year collective labour agreements with the United Mine Workers of America and the Office and Technical Employees Union expired December 31, 1991 and will expire on June 30, 1992 respectively. No substantive negotiations have taken place at time of writing.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources, *Mining in British Columbia*, 1975-1980, Vol.1, p.51; 1981-1985, p.74; 1986-1987, p.69; 1988 p.68.
_____. *Annual Report*, Engineering & Inspection Branch, 1989, p.27; 1990 p.29.
_____. *Coal in British Columbia*, Paper 1986-3, p.25.
Westar Mining Ltd., *Annual Report*, 1991.
Minfile 82G/NE-11,13,14,16,23.

BYRON CREEK COLLIERIES (COAL MOUNTAIN MINE)

Lat.49°30' Long.114°40' (82G/10E)

This open pit metallurgical and thermal coal mine is located near the old townsite of Corbin, approximately 35 km southeast of Sparwood, B.C., and 30 km east of Fernie, B.C. Access is via 25 km gravel road south from Highway 3.

Byron Creek Collieries Limited is a wholly-owned subsidiary of Esso Resources Canada Ltd., Esso Plaza, 237-4th Avenue SW, Calgary, Alberta, T2P 0H6.

The Coal Mountain operations are located on the eastern edge of the Crowsnest Coalfield. Coal Mountain comprises complex folded and faulted Jura-Cretaceous sedimentary rocks. One sub-bituminous coal seam is being mined, which averages about 30 metres in thickness.

The property is located at the old Corbin minesite, which was in production between 1908 and 1935. It is now an open pit truck and shovel mine, producing thermal and weak coking coal. The raw coal is crushed in a rotary breaker, cleaned and dried, then loaded on rail cars at the loadout facility. The mine produces 1.6 million tonnes per year for electric power generation in Ontario and the Pacific Rim.

In late January 1991, employees were informed that a decision had been made to withdraw from the export weak coking coal market. Approximately 100 workers were laid off, reducing the workforce to 225. Although the divestment of the mine had not been successful, the company remained committed to support the sale of Byron Creek Collieries to interested parties. Employees were also told that, based on future forecasts for the market, past operating costs, and the completion of the Ontario Hydro contract at the end of 1992, the mine looked to be potentially uneconomic after 1992 and thus may face closure.

Further layoffs were experienced in 1991, due to decreased export thermal coal tonnage and management initiates to bring costs in line, bringing the workforce to a level of 112. By year-end, efforts continued to be directed to divestment and operations improvement.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources, *Mining in British Columbia*, 1975-1980, Vol.1, p.50; 1981-1985, p.71; 1986-1987, p.70; 1988, p.69.
_____. *Annual Report*, Engineering & Inspection Branch. 1989 p.27; 1990, p.30.
_____. *Coal in British Columbia*, Paper 1986-3, p.26.
G.Goddard, Byron Creek Collieries, perscom. 06/05/1992.
Minfile 82G/NE-1.

FORDING

Lat.50°12' Long.114°52' (82J/2W)

The Fording open pit coal mine lies in the upper Fording River Valley, 68 km north of Sparwood. Access is via 30 km of paved road northeast of Elkford, B.C.

Fording Coal Limited is owned by Canadian Pacific Limited, 200-205 9th Avenue SE, Calgary, Alberta, T2G 0R4.

The property is in the northern section of the Elk Valley coalfield in the Fording River Valley. Medium to high volatile coal measures are contained in the Mist Mountain Formation of the Juro-Cretaceous Kootenay Group. This interbedded sequence of sandstone, siltstone, mudstone and coal has been folded into two broad, asymmetric synclines. The intervening anticline has been faulted then eroded.

Production at Fording commenced in the early 1970s. The mine operates on both sides of the Fording River with the office, maintenance site and preparation plants located on the east side at the base of Eagle Mountain. The mine is open-pit, involving multi-seam truck and shovel operations and one dragline. The coal is shipped by rail to Westshore Terminals and Thunder Bay, for sale to both domestic and export markets. In 1991, the company reported accepting a lower price from Japanese steel mills for the coming fiscal year, with the price for metallurgical coal dropping $0.50/tonne April 1, 1992 to US $51.30.

In June 1991, Fording Coal Ltd., received Mine Development Approval Process approval to proceed with its Henretta Creek dragline. A major condition of the approval is a program to restore fish in Henretta Creek after mining is completed and which will create new enhanced trout habitat in an adjacent creek.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1975-1980, Vol.1, p.51; 1981-1985, p.73; 1986-1987, p.70-71; 1988, p.70.
_____. *Annual Report*, Engineering & Inspection Branch, 1989 p.27; 1990 p.30.
_____. *Coal in British Columbia*, Paper 1986-3, p.24.
Minfile 82J/SE-9, 12.

GREENHILLS

Lat.50°10' Long.114°50' (82J/2W)

The Greenhills open pit coal mine is located 40 km north of Sparwood, B.C., and 10 km northeast of Elkford, B.C., in the upper Elk Valley. Access is via road from Elkford.

The Greenhills operation is owned by Westar Mining Ltd., 1900-1176 West Georgia Street, Vancouver, B.C., V6E 4B9.

The property is nearly midway along the Elk Basin, which is the northern section of the Crowsnest Coalfield. The seams are contained in the coal-bearing member of the Kootenay formation within an elongate synclinal formation trending north-northwest. Numerous small-scale normal and thrust faults complicate mining on the east limb and axis of the syncline. Twenty-nine seams are known to exist; however only a few are economic to mine. The coals are of medium-volatile bituminous rank, and of high-volatile A bituminous rank.

The Greenhills mine began to produce metallurgical coal in 1983. The operation is an open pit, multi-seam coal mine, using conventional truck and shovel methods. Two main end products are produced for the export market: high quality metallurgical coal and raw thermal coal at about 15% ash. These products are shipped by train to Westshore Terminals at Roberts Bank. Greenhills metallurgical coal is sold to nine Japanese corporations under annual contracts which expire on March 31, 1991, with the possibility of extension until 1993. Metallurgical coal is also sold to Pohang Iron and Steel Company Ltd. of Korea under long term-contracts extending through March 31, 2002, and to steel mills in 20 other countries throughout the world. Thermal coal is used primarily as a fuel for electrical power generation and other industrial purposes. The company's thermal coal is sold to customers around the world.

In 1991 a long range plan was completed for the Greenhills Mine which estimated that the mine has a life of 15 to 20 years under current economic and mining conditions and would not require significant additional investment.

During the past year (1991), the Greenhills mine set records for production of raw and clean coal produced. Despite the overall increase in production costs, savings from royalty taxes, transportation and selling costs resulted in a 3% reduction in the cost of each tonne sold in 1991 compared to 1990. Unfortunately, the company reports that this success was offset by the impact of price and exchange factors on revenues with the result that the margin per tonne sold decreased in 1991.

Westar reported accepting a lower price from the Japanese steel mills for the coming fiscal year, with the price of metallurgical coal dropping $0.50/tonne to US $51.80 on April 1, 1991. However, the Japanese steel industry has agreed to increase the tonnage it buys from Westar during 1992.

As a result of economies achieved from initiatives at the Balmer mine, in 1991 the Greenhills mine also commenced an equipment modernization program. During the year, two new hydraulic shovels were acquired under five-year operating leases with a further shovel and ten new 240-ton haul trucks expected to be acquired in 1992. Due to the operating savings which accrue, the company estimates the modernization program can be implemented without diminishing cash flows.

At Greenhills, the company is in the second year of a four year collective agreement which represents 80% of the employees at the mine. Westar believes this agreement reflects a strong sense of goodwill between management and employees and their desire to improve the mine's competitiveness in world markets.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources, *Mining in British Columbia*, 1975-1980, Vol.1, p.51; 1981-1985, pp.74-75; 1986-1987, p.71-72; 1988 p.71.
_____. *Annual Report*, Engineering & Inspection Branch, 1989 p.27; 1990, p.30.
Westar Mining Ltd., *Annual Report*, 1991.
Minfile 82J/SE-7.

Lat.49°57'

LINE CREEK

Long.114°46'

(82G/15W)

The Line Creek open pit coal mine site is located in the Crowsnest Pass area, approximately 24 km northeast of Sparwood, B.C. and 14 km southeast of Elkford, B.C. The plant site, located adjacent to the C.P. railway spur-line to Fording Coal, is situated 9 km downstream from the mine. Access is via an eastern lateral from Highway #43, midway between Sparwood and Elkford.

The Line Creek mine is now owned by Manalta Coal Ltd., 734-7th Avenue S.W., P.O. Box 2880, Calgary, Alberta. T2P 2M7.

The Line Creek property is situated on the west limb of the Alexander Creek syncline, near the south end of the Elk Valley Coalfield. The coal lies in the Kootenay Formation and is deposited in ten seams, of which seven are being mined in the current pit. These seven seams are thicker than 2.8 metres and have an aggregate thickness of up to 55 metres. Ninety percent of the reserves are in the four lower seams. The product is a low-medium volatile metallurgical grade bituminous coal, with the oxidized outcrop marketed as thermal coal.

Production began in 1982, with the metallurgical plant coming on stream in 1983. This is an open-pit mine, mining 12m benches using conventional truck and shovel methods. In 1987, production began from the Lower South pit adjacent to the main pit.

The mine employs about 460 people and currently sells approximately three million tonnes of coal annually, of which two million tonnes are metallurgical and the balance thermal. The coal is sold to a number of customers located in Japan, Korea, the United States and the United Kingdom.

Shell Canada Limited announced in mid-June, 1991 that it had signed an agreement in principle to sell the Line Creek operation to a subsidiary of Manalta Coal Ltd. The sale is consistent with Shell Canada's strategy to refocus its capital and management resources on its oil and gas businesses. The agreement includes provisions for the purchaser to honour existing agreements with employees, customers and other principal agreements which will enable Manalta to continue the operation of the mine.

Manalta Coal Ltd., of Calgary currently operates seven coal mines in Alberta and Saskatchewan, producing approximately 25 million tonnes of coal annually.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1981-1985, p.72; 1986-1987, p.72; 1988, p.72.
----------. *Annual Report*, Engineering & Inspection Branch, 1989 p.27; 1990, p.32.
_____. *Coal in British Columbia*, Paper 1986-3, p.25.
Mining Association of British Columbia, *MABC Newsletter*, July 1991 p.15.
Minfile 82G/NE-20

NON-OPERATING MINES/MINE CLOSURES:
There were no permanent major mine closures during 1991.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Bull River	Copper,Gold	49°30'N, 115°23'W	Robert Stanfield Holdings	Extensive drilling program

4.1.6. Volume of Inspections and Notices of Work

Mine Type	Number of Inspections	Number of Notices of Work
Coal - Surface	80	4
Coal - Underground	0	0
Exploration - Surface	41	78
Exploration - Underground	0	0
Industrial Minerals - Surface	6	0
Industrial Minerals - Underground	3	0
Metal - Surface	3	0
Metal - Underground	22	0
Placer - Surface	61	38
Placer - Underground	0	0
Sand and Gravel	30	9
Quarries	0	0
Abandoned	0	0
Other	6	0
Total	252	129

4.1.7. Summary of Activities

The Kootenay Mine Development Review Committee (KMDRC), chaired by Andrew Whale, is administered from the Fernie office, although all meetings are held in Cranbrook. The following projects formed part of the KMDRC review during 1991:

Byron Creek Collieries Ltd. – South Mine Expansion on Coal Mountain.
Domtar Construction Materials Inc. – South Quarry in the Lussier River.
Fording Coal Ltd. – Henretta Creek Dragline Project.
Westar Mining Ltd. – Harmer West Application at the Balmer Mine.
Crows Nest Resources Ltd. – MSA (North) Project at the Line Creek Mine.
Westar Mining Ltd. – Falcon 2 Project at the Greenhills Mine.

4.2 KAMLOOPS REGIONAL OFFICE

4.2.1. Office Address

200-2985 Airport Drive, Kamloops, B.C., V2B 7W8.
Tel: (604) 828-4566
Fax: (604) 828-4726

4.2.2. Office Personnel

During the year, office personnel included:

E. Sadar	District Inspector and Resident Engineer
F.J.T. Hancock	District Inspector and Resident Engineer/Office Administrator
J.E. Beswick	District Inspector of Mines and Resident Engineer
H.P. Seguin	Inspector of Mines
R. Heistad	Inspector of Mines - Mechanical
L. MacCulloch	Secretary
J. Worsfold	Office Assistant
L. Wilms	Office Assistant (aux.)

4.2.3. Area of Responsibility

The Kamloops Regional Office is responsible for Inspection Districts #3, #4, #14 and #15, lying in the south-central portion of the province (see Map 1). The District Inspectors responsible are F.J.T. Hancock for Districts #3, E. Sadar for Districts #4 and #14, and J.E. Beswick for District #15.

4.2.4. Inspection District #3

OPERATING METAL OR COAL MINES:

HIGHLAND VALLEY COPPER

Lat.50°29' Long.121°02' (92I/6E)

This open pit copper, molybdenum operation is located in the Highland Valley, 15 km west of Logan Lake, B.C. It is accessed by highway from Ashcroft, Kamloops, and Merritt, B.C.

The mine is operated by Highland Valley Copper, 3000, 700 West Georgia Street, P.O. Box 10024, Pacific Centre, 3000-700 West Georgia Street, Vancouver, B.C., V7Y 1A1, a partnership of Cominco Ltd., (50%); Rio Algom Ltd., (33.6%); Teck Corporation (13.9%); and the Highmont Mining Company (2.5%).

The mine is situated in the central core of the Upper Triassic Guichon Creek batholith, which consists of several intrusive phases and varieties of calc-alkaline igneous rocks. The youngest phase (Bethsaida) is the host rock and is porphyritic granodiorite, medium- to coarse-grained, with coarse phenocrysts of quartz and biotite. The main sulphide minerals are bornite and chalcopyrite which are associated with a quartz-sericite stockwork system, as well as sericite-rich alteration zones. Pyrite and molybdenite form a weak halo around the edge of the orebody, and a relatively narrow oxide zone occurs in the upper portion of the orebody.

Highland Valley Copper is an amalgamation of the Valley Copper (1983), Highmont (1980), Lornex (1972) and Bethlehem (1962) operations. The mine is the second largest producing copper mine in the world in terms of tonnes milled, and the seventh largest in terms of copper production.

Most of the copper concentrate produced at Highland Valley Copper is sold under long-term contracts to smelters in Japan, other Far East countries, Spain, and elsewhere. Highland Valley Copper's molybdenum production is sold as concentrates worldwide.

The Bethlehem Mill was taken off standby status and permanently closed in February 1990. This decision was taken once the two mill lines moved from the Highmont site to the Highland Mill performed with a capability essentially as had been predicted in the design studies.

Labour negotiations which began shortly after the last labour agreement ended on September 30 1991, resulted in production slowdowns by the 1,050 workers. On November 20, 1991, the mineworkers accepted a new two-year agreement retroactive to October 1, 1991.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1981-1985, pp.8-9; (Lornex) and pp.9-10 (Valley Copper); 1986-1987, p.51-52; 1988, p.49.

_____. *Annual Report*, Engineering & Inspection Branch. 1989, p.29; 1990, p.35.

A.D. McPhail, Highland Valley Copper, perscom 06/03/1992.

Minfile 92I/SW12.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

NAME: Pavilion Lake
TYPE: Quarry
PRODUCT(S): Limestone
LOCATION: 50°49'N 121°39'W
OWNER(S): Continental Lime Ltd.; Pavilion Indian Band

NON-OPERATING MINES/MINE CLOSURES:

Blackdome (51°20'N, 122°29'W) exhausted reserves and suspended mining operations in November, 1990. The concentrator continued to treat stockpiled ore until January 20, 1991. The mine produced 627,537 ounces of silver since operations began in April, 1986.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Fish Lake	Copper, Gold	51°28'N, 123°37'W	Taseko Mines Limited	Extensive surface drill program
Second	Gold	51°04'N, 122°03'W	Cyprus Gold (Canada) Ltd.	Surface drilling and trenching program
Taseko	Copper, Gold, Silver	51°05'N, 123°24'W	Alpine Exploration Corporation	Extensive surface drilling program

4.2.5. Inspection Districts #4 and #14

OPERATING METAL OR COAL MINES:

BEAVERDELL (Highland Bell)

Lat.49°26' Long.119°04' (82E/6E)

This underground silver mine is situated on Wallace Mountain immediately east of Beaverdell, B.C., and 60 km south of Kelowna, B.C.. The mill and tailings pond are located on the west side of the West Kettle River, and the concentrator is on the flat below Beaverdell.

The mine is owned by Teck Corporation, 200 Burrard Street, Vancouver, B.C. V6C 3L9.

The ore is contained in highly fractured and faulted quartz and calcite veins. These veins are found in a large body of quartz diorite which extends into the sedimentary Wallace formation to the east. The veins contain galena, sphalerite, chalcopyrite and pyrrhotite, with occurrences of pyrargyrite and native silver. The mineralization may extend for short distances into the wall rock where it has been altered.

The underground mine is one of the oldest in the district. The ore is mined by open stoping methods using conventional narrow vein mining methods. Broken ore is trammed to the surface bins then trucked to the mill. After crushing and grinding, concentration is carried out to produce a jig concentrate and two flotation concentrates which are transported by truck to the smelter at Trail, B.C.

Declining silver prices and a high Canadian dollar forced the closure of Beaverdell in February 1991. The mine has produced over 40 million ounces of silver since production began in 1898. The mine employed 36 people and produced about 325,000 ounces of silver annually.

References:

B.C. Minister of Mines. *Annual Report* 1949, pp.145-148.
B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1975-1980, Vol.1, p.8; 1981-1985, p.6; 1986-1987, p.49-50; 1988, p.46.
_____ *Annual Report*, Engineering & Inspection Branch. 1989, p.30; 1990, p.37.
Minfile 82E/SW-30, 72, 133.

GOLDSTREAM

Lat.51°38' Long.118°27' (82M/09W)

The Goldstream property is located approximately 80 kilometres north of Revelstoke, B.C. on the Goldstream River. It is accessed via Highway 20 from Revelstoke.

The mine is jointly owned by Bethlehem Resources Corporation and Goldnev Resources Inc., and operated by Bethlehem Resources Corporation, Suite 700 - 815 West Hastings Street, Vancouver, B.C. V6C 1B4.

The deposit occurs concordant with the surrounding rock units at a particular stratigraphic horizon, raking across the dip of other units. The mineralized zone, averaging three metres in thickness, consists of a single, continuous bed of massive and disseminated sulphides.

Mining is by drift and long hole methods in the underground mine, and by conventional methods in the small open pit. Concentrates from the mill are transported to Revelstoke by truck and then to Vancouver via CP Rail for shipment to Japanese smelters.

Production at this copper, zinc mine originally began in 1983 and was closed in April 1984, due to depressed metal markets. However, rehabilitation of the mine, which was financed by Nippon Mining Company and Sumitomo Corporation, was completed in May, 1991 at a cost of $4.4 million. The mine officially reopened in July, 1991, and upon reopening the deposit contained enough ore for five years of operation. The mine currently employs approximately 100 people, and is expected to produce an average of 16 million kg of copper and 2 million kg of zinc per year.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1981-1985, p.21.

----------. *Mineral Market Update*, 1991. Vol. 3 No.1, Vol.3 No.3.

Minfile 82M-141.

NICKEL PLATE

Lat.49°22' Long.120°02' (92H/8E)

This open pit gold/silver operation is located 6 km north of Hedley and about 40 km west of Penticton, B.C. Main access is from Penticton, via Apex Mountain Road and Nickel Plate Lake Road.

The mine is owned by International Corona Corporation, Suite 2500, 666 Burrard Street, Vancouver, B.C. V6C 2X8. (Company changed name from Corona Corp., in June, 1991).

The ore occurs in sediments of the Hedley Formation, where silicification has taken place forming skarn minerals. Ore concentration is controlled by intrusive dioritic dykes and sills which separate the mineralized beds. Gold occurs as minute grains in association with arsenopyrite and bismuth tellurides, and as electrum associated with late stage intergrowths of chalcopyrite, pyrrhotite, and sphalerite. Silver, copper, and cobalt are also present.

The Nickel Plate mine operated as an underground mine from 1904 to 1931, and from 1934 to 1955, and by open pit mining since 1987.

The company reports that in 1991, production of gold and gold equivalent increased almost 20% from 1990, to more than 91,000 ounces. Unit operating costs were maintained at $27 per ton milled and reduced to US$328 per ounce from US$387 per ounce in 1990. These improvements, combined with a gold hedging program, allowed this high-cost producer to operate at a profit well in excess of its budget.

A 16% increase in grade and a 1% increase in recovery to 85% were the main contributing factors to higher production. Mill throughput increased slightly in 1991, with an average of 3,485 tons of ore being processed daily, compared to 3,477 tons per day in 1990.

The company believes that proven and probable reserves at Nickel Plate (2,060,000 tons grading 0.090 oz/ton gold at January 1, 1992) should allow operations to continue until the spring of 1993, although the mine's life could be extended beyond that point if a current economic evaluation of a potential expansion of the north pit proved positive.

A new $2 million treatment plant which uses sulphur dioxide to destroy cyanide concentrations in the mill effluent began running continuously in September, 1991, and has performed well since start-up. The system has reduced tailings stream cyanide concentrations to within permit compliance levels and is far less expensive to operate than the hydrogen peroxide system it replaced.

In 1991, the Nickel Plate mine received the award from the Ministry of Mines for the lowest accident frequency rate in the Province for class 'B' mines.

References:
B.C. Ministry of Energy, Mines & Pet. Res. *Mining in British Columbia*, 1981-1985, p.21; 1986-1987, p.61-62; 1988 p.61.
----------. *Annual Report*, Engineering & Inspection Branch. 1989, p.31; 1990, p.38.
International Corona Corporation, *Annual Report*, 1991.
International Corona Corporation, perscom., 06/06/1992.
Minfile 92H/SE62.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

There are no industrial mineral or structural material mines in this district which produce more than 100,000 tonnes per year.

NON-OPERATING MINES/MINE CLOSURES:

Beaverdell (49°26'N, 119°04'W): Declining silver prices and a high Canadian dollar forced the closure of Beaverdell in February 1991. The mine has produced over 40 million ounces of silver since production began in 1898. The mine employed 36 people and produced about 325,000 ounces of silver annually.

Brenda Mine (49°53'N, 120°05'W): Operations ceased permanently at the Brenda Mine on June 8, 1990. The Brenda Mine Public Surveillance Committee, chaired by the Resource Management Branch, continued to meet regularly to monitor the abandonment and reclamation of the mine. During 1991, the Thompson Okanagan Manufacturers' Authority (TOMA) was formed to pursue a proposal to transform the Brenda site into an industrial estate.

Dankoe Mill (49°03'N, 119°41'W): The Dankoe Mill, which produces gold and silver concentrates, did not operate in 1991.

Skylark (O.B.) 49°05' 118°37' Skylark Resources Ltd: This underground silver/gold mine closed in April, 1989 due to declining silver prices.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
J.&.L.	Gold,Silver,Lead,Zinc	51°17'N, 118°08'W	Cheni Gold Mines Inc.	Surface and underground drilling
Dill	Copper,Gold	49°45'N, 120°25'W	Fairfield Minerals Ltd.	Surface drilling.
Elk	Gold,Silver	49°50'N, 120°19'W	Fairfield Minerals Ltd.	Surface drilling.

4.2.6. Inspection District #15

OPERATING METAL OR COAL MINES:

AFTON

Lat.50°39' Long.120°30' (92I/10E; 92I/9W)

The Afton open pit copper/gold/silver mine is alongside the Trans-Canada Highway, 13 km west of Kamloops, B.C., at 640 metres elevation.

The mine is owned by Teck Corporation (100%), 200 Burrard Street, Vancouver, B.C., V6C 3L9.

Copper mineralization at the Pothook deposit consists mainly of chalcopyrite with chalcocite, bornite and native copper. The Crescent deposit is on the northern contact of the Iron Mask Batholith and consists mainly of chalcopyrite, occurring as blebs and disseminations. The Ajax deposit lies at the southern contact of the Iron Mask Batholith as a multi-unit intrusive body. Copper mineralization is associated with the Sugarloaf Diorite, a younger intrusive phase typically of fine-medium grained porphyritic diorite. Chalcopyrite is the predominant copper mineral and the only one of economic significance. It occurs as blebs and disseminations, in fractures, veinlets and microveinlets, and occasionally in breccias and vugs with accompanying calcite. Gold mineralization is closely associated with chalcopyrite mineralization.

The Afton mine is a large open pit copper operation which came into production in 1977. Mining at the original Afton pit ceased in July, 1987 at which time the Pothook pit, located two km southwest of the plant site, was brought into production. This pit was mined until October, 1988 when reserves were exhausted and the Crescent pit, located three km east of the plant site, was brought into production. A 1988 decision to place the Ajax deposit into production will extend the life of the Afton operation by seven to eight years. During 1990, the company completed the installation and commissioning of an in-circuit pebble crusher and screening system which increased mill throughput to 8,500 tonnes per day. The Ajax East pit was re-stripped and put into production, and a diamond-drill program was carried out in the Ajax West Zone to define ore reserves for ultimate development.

Afton announced on May 24, 1991 that it was considering suspending operations because of unfavourable market conditions. Notice of layoff was given to 152 hourly employees on that date and to 44 technical and management employees on June 24, 1991.

The company's attempt to secure the union's participation under the Job Protection Act so that operations could continue proved unsuccessful. Operations were therefore suspended on August 23, 1991. The company plans to resume operations given more favourable market conditions.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *G.E.M.*, 1972, pp.209-220.
_____. *Mining in British Columbia*, 1975-1980, Vol. 1, pp.11-12; 1981-1985, p.7; 1986-1987, p.50-51; 1988, p.48.
_____. *Annual Report*, Engineering & Inspection Branch. 1989 p.32; 1990, p.40.
C.I.M. *Porphyry Deposits of the Canadian Cordillera*, 1976, pp.376-387.
Teck Corporation, perscom. 06/01/1992.
Minfile 92I/NE-23,26,30.

CRAIGMONT PROJECT

Lat.50°12' Long.120°55' (92I/2W)

Although the Craigmont operation is not a major mine in terms of volume of production, it is interesting in terms of its strategic supporting role to the Province's major coal producing operations. For this reason, a description of the operation is included in this year's annual report.

The Craigmont property is located 16 kilometres northwest of Merritt, B.C., and is accessed by a branch road from the highway at Lower Nicola.

The property is owned by Craigmont Mines Ltd., 820 - 355 Burrard Street, Vancouver, B.C. V6C 2G8

The original Craigmont copper mine went into production in 1962, with underground mining ceasing in February 1982 as a result of the falling price of copper. The concentrator remained in operation processing the iron ore stockpiles until November, 1982 when it was also shut down.

From the commencement of its operation in 1962 until 1970, Craigmont Mines Limited did not recover the magnetite in its milling process, and on a material-balance basis there is estimated to be in the order of five million tonnes of magnetite in the tailings deposit. The company reports that exploration completed in 1991 proved the presence of in excess of one million tonnes of magnetite in the southerly one quarter of the tailings.

Since the cessation of production in 1982, magnetite has been shipped from the stockpiles at Craigmont to western Canadian and United States coal producers, to be used as an essential component in their heavy media separation process.

Magnetite remaining in the original stockpiles as of 1992 represents approximately three years of industry requirements, based on the current level of usage. In order to replenish the stockpiles, in 1991 the company applied for the necessary government permits to construct a facility to recover the magnetite from the old tailings deposit. Production from the plant is scheduled to commence in the fall of 1992.

References:

B.C. Ministry of Energy, Mines and Petroleum Resources. *Mining in British Columbia*, 1981-1985. p.13.; 1986-1987, p.55.
R.C. Hermann, Craigmont Mines Ltd., perscom. 06/13/1992.
Minfile 92I/SE-35

SAMATOSUM

Lat.51°10' Long.119°47' (82M/4W)

This open pit silver/gold/copper/lead/zinc property is located on Samatosum Mountain near the town of Barriere, about 100 km north of Kamloops, B.C. It is accessed by 39 km of road from Barriere, via the Agate Bay road.

The project is owned by Minnova Inc., Samatosum Division, #1 - 2901 Adelaide Street East, Toronto, Ontario, M5C 2Z7 (70%) and Rea Corporation, World Trade Centre, 536-999 Canada Place, Vancouver, B.C., V6C 3E1 (30%).

The deposit lies within the Eagle Bay Assemblage of strongly foliated and overturned Palaeozoic rocks in association with mafic pyroclastics, sericitic tuffs, cherts, muddy tuffs and sediments. The Muddy Tuff unit is often well mineralized with up to 60% pyrite, minor zinc-lead-copper, and up to 60g/tonne silver over

thicknesses of 10-15 metres. Much of the orebody is a stratabound quartz vein, with lesser portions of mineralized and altered wall rock materials. The flat, plunging, tabular orebody averages approximately six metres in thickness and is 500 metres long by 80 metres high. Economic mineralization consists of tetrahedrite, the principal silver mineral, sphalerite, galena, chalcopyrite and electrum.

During the first half of 1988, activities focused on a feasibility study and preparation of a Stage I Report. The Report was approved, and Approval-in-Principle granted, by November, 1988. By year end development had begun, with construction of the mine access road, plant site, tailings dam, building foundations and other related facilities underway.

The Samatosum mine was completed ahead of schedule and within budget. The mill operated at nominal capacity of 450 tonnes per day since operation began in July, 1989. By early 1990, the recovery rates increased substantially over those achieved during the tune-up phase. Milling is by conventional flotation methods to produce a silver-copper concentrate, a zinc concentrate and a lead concentrate.

The mine is an open pit operation but favourable drilling results in 1991 resulted in a decision to proceed with underground development. It is expected that 2.6 million ounces of silver and 4,389 ounces of gold will be extracted by October 1992, when both open pit and underground reserves will be depleted.

The mine employs about 75 people.

References:

Ministry of Energy, Mines and Petroleum Resources. *Annual Report*, Engineering & Inspection Branch. 1990, p.40.

_____. *Mineral Market Update*, 1991. Vol.3 No.1; Vol.3 No.3.

Minfile 82M-244.

Lat.49°20'

SIMILCO (Similkameen)

Long.120°33'

(92H/7E)

The Similco open pit copper/silver/gold mine is situated 15 km west of Princeton on the Hope-Princeton Highway.

Similco Mines Ltd., is wholly-owned by the Princeton Mining Corporation, #2000 - 1055 West Hastings Street, Vancouver, B.C. V6E 3V3. The mine address is P.O. Box 520, Princeton, B.C. V0X 1W0

The original mining operation at the Similco mine site, the Copper Mountain mine, closed in 1957. In 1971 Newmont Mining Corporation reactivated mining in the camp. With the company's purchase of the Similkameen Mine from Newmont in 1988, commitments have been made to extend the mine life into the mid-1990s.

All of the known copper deposits lie in a 1,100 metre by 4,300 metre belt of Nicola volcanic rocks, bounded on the south by the composite Copper Mountain stock and on the north by the Lost Horse intrusive complex. It is believed that the Copper Mountain intrusions, the mineralization associated with them, and the volcanic rocks, are all of late Triassic age. Fluids producing alteration and mineralization came from the Lost Horse complex of porphyries and porphyry breccias. Alteration is intense, involving biotite, later pink feldspar, and scapolite. Mineralization of chalcopyrite and bornite is in fracture fillings and disseminations. Pegmatite veins, containing potash feldspar, biotite, and striking masses of bornite occur up to 2.3 metres thick. At year-end 1991, mineral reserves totalled 159.8 million tons grading 0.40% copper.

This is a conventional open-pit mine. The ore is crushed at Copper Mountain then transported via conveyor over a suspension bridge to the concentrator. The concentrate is trucked to Vancouver for shipment.

In early 1991, the company reported that a drilling program on the Similkameen property had significantly raised the grade and tonnage of the Virginia and Alabama zones. The combined ores have total potential open pit reserves of 25 million tons. Mining in the Virginia pit commenced in October, 1991.

Effective February 15, 1991 Princeton Mining Corp. announced a revised mine plan which reduced operating costs and included development of the Virginia Zone. The mining rate decreased from 65,000 to 45,000 tons per day, and the work force was reduced by 47 people.

A strike began at the mine on May 31, 1991 involving about 270 members of CAIMAW. A vote in favour of a new collective agreement resulted in employees being recalled to work beginning October 17, with production resuming October 21, 1991. The new agreement gave employees an average increase of about five per cent per year over the term of the contract, which runs to March 31, 1994. The package also includes an enhancement of the pension plan for past service to be paid from a percentage of future cash flow.

The Similco mine now employs 166 people.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. Bull. 59, *Geology of Copper Mountain, British Columbia*, 1972.

_____. *Mining in British Columbia*, 1975-1980, Vol.1, pp.28-29; 1981-1985, pp.22-23; 1986-1987, p.62-63; 1988, p.62.

_____. *Annual Report*, Engineering & Inspection Branch. 1989, p.32; 1990 p.41.

_____. *Mineral Market Update*, 1991. Vol 3 Nos.1,2,3 and 4.

C.I.M. *Porphyry Deposits of the Canadian Cordillera*, 1976, pp.368-375.

Princeton Mining Corporation, Annual Report, 1991.

Minfile 92H/SE-13.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

There were no industrial mineral or structural material mines producing more than 100,000 tonnes per year in 1991.

NON-OPERATING MINES/MINE CLOSURES:

Afton (50°39'N, 120°30'W): Afton Mines Ltd. announced on May 24, 1991 that it was considering suspending operations because of unfavourable market conditions. Notice of layoff was given to 152 hourly employees on that date and to 44 technical and management employees on June 24, 1991. The company's attempt to secure the union's participation under the Job Protection Act so that operations could continue proved unsuccessful. Operations were therefore suspended on August 23, 1991.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Axe Log	Copper, Gold Copper, Gold	49°37'N, 120°30'W 49°46'N, 120°34'W	Cominco Ltd.	Drilling
Missezula Lake	Copper, Gold	49°45'N, 120°30'W	Minnova Inc.	Drilling
Chu Chua	Copper,Zinc,Silver,Gold	51°24'N, 120°05'W	Minnova Inc.	Drilling
Whipsaw	Copper,Gold,Moly	49°18'N, 120°47'W 49°16'N, 120°45'W	Minnova Inc. Phelps Dodge Corp. of Canada	Drilling and trenching Drilling
Birk Creek	Copper, Lead, Zinc	51°25'N, 119°55'W	Falconbridge Ltd.	Drilling and trenching
Allenby	Zeolite	49°25'N, 120°31'W	Princeton Industrial Minerals Ltd.	Trenching
Shear	Copper, Gold	49°57'N, 120°36'W	Int'l Northair Mines Ltd.	Drilling
Siwash	Gold	49°46'N, 120°17'W	Int'l Tower Hills Mines Ltd.	Drilling
Lodestone	Platinum, Palladium	49°28'N, 120°49'W	Tiffany Resources Inc.	Drilling

4.2.7.

Volume of Inspections and Notices of Work

Mine Type	Number of Inspections	Number of Notices of Work
Coal - Surface		
Coal - Underground		
Exploration - Surface	107	225
Exploration - Underground	7	4
Industrial Minerals - Surface	5	
Industrial Minerals - Underground		
Metal - Surface	47	
Metal - Underground	5	
Placer - Surface	57	92
Placer - Underground	3	13
Sand and Gravel	16	6
Quarries	4	6
Abandoned	1	
Other	0	
Total	252	346

4.2.8. Summary of Activities

The North Group (Kamloops) and South Group (Penticton) are the two main project development and review committees which operate out of the Kamloops office, in addition to *ad hoc* committees for the Revelstoke and Chilcotin areas. During 1991, the South Central Mine Development Review Committee met frequently to review the following projects:-

- Polestar Resources Ltd. - Crystal Peak Garnet Project
- Similco Mines Ltd. - Permit amendment
- Candorado Mines Ltd. - Permit amendment
- Teck Corporation - Beaverdell Mine - Closure
- Stump Lake - Abandoned mine tailings
- International Corona Corp. - Nickel Plate Mine - Ongoing permit review and monitoring
- Craigmont Mines Ltd. - Magnetite Project - Permit Review.

4.3. NANAIMO REGIONAL OFFICE

4.3.1. Office Address

1A - 3411 Shenton Road, Nanaimo, B.C., V9T 2H1.
Tel: (604) 755-2486. Fax: (604) 755-2474

4.3.2. Office Personnel

During the year, office personnel included:

R. Bone	District Inspector and Resident Engineer/Office Administrator
E.W. Beresford	District Inspector and Resident Engineer
J.C. Alvarez	Inspector of Mines
G. Peachey	Secretary
L. Quinn	Office Assistant

Harold Armour retired in September, 1991 and Kathy McKay left the ministry in October, 1991. During the year, Lise Quinn moved from auxiliary to regular status.

4.3.3. Area of Responsibility

The Nanaimo Regional Office is responsible for Inspection Districts #7 and #8 (see Map 1). The office administers Branch programs in the Vancouver Island and Lower Mainland areas. Previously, R. Bone was responsible for District #8 and E. Beresford for District #7; however, organizational changes in 1991 saw the occupational health and safety inspections and concerns becoming the responsibility of R. Bone in both Districts 7 and 8, and permitting and approvals becoming the responsibility of E. Beresford in both districts.

4.3.4. Inspection District #7

OPERATING METAL OR COAL MINES:
There are no major metal or coal operations in this district.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:
There are no major industrial mineral or structural material properties in this district. However, the district encompasses over two hundred small to medium-size gravel and quarry operations, some of which narrowly miss the "major" categorization. Six operations produce over 1 million tonnes of gravel and aggregate materials.

NON-OPERATING MINES/MINE CLOSURES:

Carolin (Ladner Creek) mine remains on care and maintenance since its closure in 1984.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Chilliwack Lake	Dimensional Stone	49°08'N, 121°17'W	Granite Pacific Industries Ltd.	Drill program
Sumas Mountain	Feldspar	49o06'N, 122o09'W	Jack Lee	Drilling, trenching, sampling
Texada Island	Limestone	49o10'N,125o40oW	CBR Cement (Canada) Ltd.	Prospectus

4.3.5. Inspection District #8

OPERATING METAL AND COAL MINES:

ISLAND COPPER

Lat.50°36' Long.127°28' (92L/11W,12E)

This open pit copper and molybdenum mine is located on Vancouver Island, 16 km south of Port Hardy, B.C., and 8 km east of Coal Harbour, B.C., on the north shore of Rupert Inlet. It is accessed by road from Port Hardy.

The mine is operated by BHP Minerals Canada Ltd., a wholly-owned subsidiary of BHP Minerals International Inc., 550 California Street, San Francisco, California, 94104. (BHP Minerals is one of three business groups of The Broken Hill Proprietary Company Limited, headquartered in Melbourne, Australia). The mine address is P.O. Box 370, Port Hardy, B.C., V0N 2P0.

The orebody is an elongated ellipse, subparallel to the regional trend. It occurs within rocks of the Bonanza Group, including coarse to fine andesitic to dacite breccias and tuffs. Intrusive into the volcanic rocks is an irregular dyke of quartz-feldspar porphyry which dips at 45°-60° to the north. The orebody is draped about the dyke. The ore zone is strongly fractured, with chalcopyrite and molybdenite occurring in veinlets. About 75% of the ore is in volcanic rocks and the remainder, on both sides of the dyke, is in marginal breccia.

Production began from this open-pit mine in late 1971. The type of mining employed is shovel/truck, with an in-pit crusher/conveyor. Annual production capacity is 20,384,000 tonnes mill feed (56,000 tpd through the concentrator). Copper concentrate is shipped to smelters in Japan, while molybdenum concentrate is dried, packaged into steel drums and trucked to Vancouver. Shipments to overseas markets are made through an adjacent port facility on Rupert Inlet.

Operations at the mine were suspended from May 24, to June 12, 1991 as a result of strike action. Union members voted a close 52 percent in favour of accepting a final offer. The Island Copper Mine employs roughly 575 workers and production is expected to continue until 1997.

Since 1981, BHP and its employees have participated in a Salmon Enhancement Program on the Marble River. The program, which is funded jointly by the Department of Fisheries, BHP and Western Forest Products was initiated when it was discovered that the Marble River salmon population had been seriously diminished by overfishing. In the summer of 1991 a new hatchery was constructed which raised the capacity for handling eggs to 4 million per year.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1975-1980, Vol.1. pp.16-17; 1981-1985, p.12; 1986-1987, p.54-55; 1988 p.54.
_____. *Annual Report*, Engineering & Inspection Branch. 1989 p.35; 1990 p.45.
Mining Association of British Columbia. *Newsletter*, March, 1991. p.15.
C.I.M. *Porphyry Deposits of the Canadian Cordillera*, 1976, pp.206-218.
M.A. Walker, BHP Minerals, perscom. 06/12/1992.
Minfile 92F-62,99,135.

MYRA FALLS OPERATION (Lynx, H-W)

Lat.49°34' Long.125°35' (92F/12E)

The Myra Falls underground copper/zinc mine is located on the west side of the south end of Buttle Lake, 60 km southwest of Campbell River, B.C. Access is via paved road, Highway 28, 90 km southwest of Campbell River. The mine is situated at the south end of Buttle Lake in Strathcona Provincial Park.

The operation is owned by Westmin Resources Ltd., Suite 904, 1055 Dunsmuir Street, P.O. Box 49066, The Bentall Centre, Vancouver, B.C. V7X 1C4.

Ore deposits consist of massive sulphides, including pyrite, chalcopyrite, sphalerite, and galena, occurring in volcanic rocks of the Sicker Group. The Lynx mine is within a single structural stratigraphic zone 400 to 500 metres thick, which has been traced over a strike length of 6,000 metres. The mine area comprises segments of a zone of rhyolite, other volcanic rocks, and ore. The H-W mine is at a stratigraphic level 100 metres lower. In this area, rocks ranging from massive volcanic rock to breccias, tuffs, and clastic sediments have been affected by dynamothermal metamorphism.

The Myra Falls operations comprise the H-W and Lynx underground copper/zinc mines together with a 3,650 tonne per day milling facility and self contained hydro and diesel power facility. The operations, which commenced production more than 25 years ago in December 1966, have now produced more than 12.7 million tonnes of ore, with a gross value in excess of $2.1 billion, at recent metal prices. The mine ships concentrates by road from Campbell River and then by sea to Korea and Japan.

In August, 1991 Westmin announced the lay-off of 98 employees; this reduced the total number of employees from 568 at end of 1990 to 451 at 1991 year end. The company reported that the reductions reflect the efficiencies of the move to long hole mining and the need to make the operation more cost competitive. A Job Search Centre was established in September to assist laid off employees.

By year-end, Myra Falls' exploration results lived up to their early promise: after milling 1,081,400 tonnes of ore in 1991, the company recorded a net gain of 540,800 tonnes of significantly higher grade of ore, as well as adding 1.7 million tonnes of possible ore. As of January 1, 1992 mineable proven and probable reserves stood at 10,515,800 tonnes for the H-W, Lynx, Price, Gap and Battle Zones.

During 1991, the operations were largely converted to more productive long hole stoping and by year-end over 70 percent of ore was being produced by this method. From November, 1991 operating costs averaged $50 per tonne or less and the property was achieving a modest positive cash flow. During the comparable period in 1990/1991, the company reported, the operating costs averaged $66 per tonne and the cash flow was negative.

In March 1991, the Tunnel and Rock Workers and the International Union of Operating Engineers were officially certified as the bargaining unit for the 347 unionized employees. The current labour agreement expires March 31, 1993.

References:
B.C. Minister of Mines. *Annual Report*, 1964, pp.157-166.
B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, Vol.1, 1975-1980, pp.1-2; 1981-1985, p.2; 1986-1987, p.44-45; 1988 p. 41.
_____. *Annual Report*, Engineering & Inspection Branch. 1989, p.35; 1990, p.45.
Mining Association of British Columbia. *Newsletter*. September, 1991 p.3.
Westmin Resources Ltd. News Release, *1991 Results*, March 5, 1992.
Westmin Resources Ltd. *Annual Report 1991*
Minfile 92F-71, 72, 73.

QUINSAM COAL

Lat.49°50' Long.125°33' (92F/14W)

This open pit and underground coal operation is located on Vancouver Island, southwest of Campbell River, B.C. Access is through the City of Campbell River via Highway 28, kilometre 20, then west on the mine access road for 10 km.

In 1991, the mine was owned by Brinco Coal Corp., 1280-1055 West Hastings Street, Vancouver, B.C., V6E 2E9. The mine address is Kilometre 18, Highway 28, P.O. Box 938, Campbell River, B.C. V9W 6Y4.

The mine is located in the Middle Quinsam Lake area where three coal seams have been identified in the Comox sediments which dip uniformly to the northeast at angles between six and ten degrees. The reserves are almost entirely in the No. 1 (lowest) seam, which averages 2.5 to 4 metres in thickness.

The mining method at Quinsam was originally open pit, but this is being phased out and most of the current production comes from room and pillar mining, accessed via three parallel headings driven down dip from the pit high wall.

The Quinsam mine began commercial production on April 12, 1989 and supplies thermal coal to electrical power utilities, industrial boiler applications and cement plants in Japan, as well as supplying coal to cement plants along the west coast of North America.

Quinsam's clean coal is trucked approximately 30 kilometres by independent owner-operators to a government wharf at Middle Point near Campbell River, where it is dumped directly onto a 4,000 DWT barge. The barge delivers the coal to Texada Island where it is unloaded, and then reloaded onto panamax-size (77,000 DWT) vessels for transportation to the Pacific Rim. A preliminary engineering study has identified the area of the current barge loading facility as a potential deep water port for Panamax-size vessels. Permit applications were submitted for the facility, and construction could commence in July, 1992 for completion during the summer of 1993.

The company reports that Quinsam's geological reserve base totals approximately 184 million tonnes, comprised of 44 million tonnes in the present mining area and 140 million tonnes at properties under Quinsam control within 80 kilometres of the mine.

During 1991, Quinsam continued with development of the underground mine, and the South open pit walls were started. It is expected that just under half of the 1991 production will come from the new underground mine. Also, construction was completed on the 200-tonne-per hour washplant to reduce the ash content of the coal as well as the amount of waste rock shipped with the final product.

Consolidated Brinco and Hillsborough Resources signed an agreement to merge their two companies, subject to company and regulatory approval. Hillsborough announced that the focus of the merged company will be to expand production at the Quinsam mine to one million tonnes of thermal coal per year. Quinsam plans to produce up to 500,000 tonnes in 1992, and employs approximately 50 people.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources. *Coal in British Columbia*, Paper 1986-3, p.30.
_____. *Mining in British Columbia*. 1986-1987, p.75; 1988 p.76.
_____. *Annual Report*, Engineering & Inspection Branch. 1989 p.35; 1990 p.46.
_____. *Mineral Market Update*. Vol.3 Nos. 1, 3 and 4. Vol.4 No.1.
Hillsborough Resources Ltd., *Annual Report*, 1991.
M.P. Dickson, Hillsborough Resources Ltd., perscom. 06/08/1992.
Minfile 092F-319.

STRUCTURAL MATERIALS OR INDUSTRIAL MINERAL MINES

NAME:	Imperial
TYPE:	Open Pit
PRODUCT(S):	Limestone
LOCATION:	49o44'N, 124°23W'
OWNER(S):	Imperial Limestone Ltd.

NAME:	Holnam West (Gillies Bay)
TYPE:	Open Pit
PRODUCT(S):	Limestone
LOCATION:	49°34'N, 124°30'W
OWNER(S):	Holnam West Materials Ltd.

NAME:	Blubber Bay
TYPE:	Open Pit
PRODUCT(S):	Limestone
LOCATION:	49°47'N, 124°37'W
OWNER(S):	Ash Grove Cement West Inc.

NAME:	Nanaimo
TYPE:	Open Pit
PRODUCT(S):	Shale
LOCATION:	48°00'N, 124°00'W
OWNER(S):	Dunsmuir Quarries Ltd.

NON-OPERATING MINES/MINE CLOSURES:
There were no closures in 1991.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Expo (Hushamu)	Copper, Zinc	50°42'N, 27°56'W	Moraga Resources Ltd.	Extensive surface drilling program
Red Dog	Copper, Gold	50°40'W, 127°50'N	Crew Natural Resources Ltd.	Extensive surface drilling program

4.3.6. Volume of Inspections and Notices of Work

Mine Type	Number of Inspections	Number of Notices of Work
Coal - Surface	16	0
Coal - Underground	9	1
Exploration - Surface	82	123
Exploration - Underground	4	0
Industrial Minerals - Surface	14	0
Industrial Minerals - U/G	0	0
Metal - Surface	10	0
Metal - Underground	19	0
Placer - Surface	37	25
Placer - Underground	0	0
Sand and Gravel	442	41
Quarries	70	0
Abandoned	14	0
Other	1	19
Total	718	209

4.3.7. Summary of Activities

The Vancouver Island Mine Development Review Committee under the chairmanship of R. Bone, reviewed the following projects in 1991:

- Quinsam Coal - South Open Pits.
- Westmin Mines Ltd. - Review of Permit Conditions and Reclamation Bond.
- BHP-Utah Mines Ltd. - Review of Permit Conditions and Reclamation Bond.
- Chester Millar - Villalta Gold - Prospectus received June, 1991 for 10,000 tonne heap leaching project near Nanaimo.

The following project was reviewed under the chairmanship of Eric Beresford in 1991:

- Westmin Mines Ltd. - Thelwood Valley - Surface drilling program.

The Lower Mainland Mine Development Review Committee, under the chairmanship of E. Beresford, reviewed the following main projects in 1991:

- CBR Cement (Canada) Ltd. - Texada Limestone Project - Prospectus.
- Quarry Pacific Industries Ltd. - Exploration for Dimensional Stone and Tile.

Both local Mine Development Review Committees are now under the chairmanship of E. Beresford.

Safety-related matters which involved the Nanaimo office included:

- Sulphide Dust Explosions - Westmin Mine.
- Acid Leaching Problem - Britannia Mine (abandoned).

4.4. NELSON REGIONAL OFFICE

4.4.1. Office Address

403 Vernon Street, Nelson, B.C., V1L 4E6.
Tel: (604) 354-6125 Fax: (604) 354-6120

4.4.2. Office Personnel

During the year there were no changes in staff, and office personnel consisted of:

M.A. Mellor	District Inspector of Mines
A.L. O'Bryan	Inspector of Mines - Reclamation
D. Roach	Inspector of Mines (seasonal, part-time)
S. Beatty	Secretary
S. Smith	Office Assistant

4.4.3. Area of Responsibility

The Kootenay Region is currently administered by two separate offices, one in Fernie and one in Nelson. The Nelson Regional Office is responsible for Inspection District #5 located in the West Kootenays. M.A. Mellor is the District Inspector.

4.4.4. Inspection District #5

OPERATING METAL OR COAL MINES:

SILVANA (Silmonac)

Lat.49°50' Long.117°11' (82F/14W)

The Silvana underground silver/lead/zinc mine is located on the east bank of Tributary Creek, 1.6 km west of Sandon, B.C. Access is via eight km of paved highway and six km of gravel road from New Denver, B.C.

The mine is owned by Treminco Resources Ltd., 1110, 625 Howe Street, Vancouver, B.C. V6C 2T6.

The deposit lies in the main Slocan lode; the structure being mined occurs as a lode within a strong shear that cuts Slocan Group sedimentary rocks and dips at 20-30 degrees. The oreshoots vary in width from a few centimetres to three metres, and can be considerably altered by graphite shearing. Lead and zinc mineralization, with significant silver content, occurs in veins, pods and lenses and is mainly in the form of argentiferous galena and sphalerite.

The mine essentially comprises the old Ruth Hope and Silversmith properties with operations dating back to 1927. This is an underground silver mine using a subdrifter slash room and pillar method. Lead and zinc concentrates are produced and hauled to the smelter in Trail.

Treminco announced the layoff of eight employees in January, 1991 due to extremely low silver prices combined with depressed lead and zinc prices. In February, the company reported commencing a mine underground exploration program on the newly-acquired Hinkley mining claim approximately three kilometres from the Silvana mill.

The Silvana mine officially closed July 26, 1991 but was reopened July 29, 1991 on a much smaller scale employing half the staff. The operation will mine and mill approximately half the ore in previous years (31,574 tonnes in 1990).

References:
B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1975-1980, Vol.1, pp.36-37; 1981-1985, p.27; 1986-1987, pp.64-65; 1988 p.65.
_____. *Annual Report*, Engineering & Inspection Branch. 1989 p.39; 1990 p.49.
Minfile 82F/NW-50.

INDUSTRIAL MINERALS AND STRUCTURAL MATERIALS:

There are no industrial mineral or structural material mines in this district producing more than 100,000 tonnes per year.

NON-OPERATING MINES/MINE CLOSURES:

The **Silvana** mine closed for three days during July, 1991.

The **South Fork Silica** mine operated only from existing stockpiled material in 1991.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Iron Colt Mine	Gold, Silver	49°05'N, 117°47'W	Vangold Resources Inc.	Underground drift development and diamond drilling
Royal Canadian/Nevada	Gold, Silver	49°29'N, 117°24'W	Hibernian Development Ltd.	Underground drift development, surface and underground diamond drilling
Kenville Mine	Gold	49°23'N, 117°23'W	Springboard Resources	Underground rehabilitation; sublevel development and diamond drilling; mill rehabilitation
Katie	Copper, Gold	49°09'N, 117°20'W	Yellowjack Resources Ltd. /Noranda Exploration	Extensive surface diamond drilling program

4.4.5. Volume of Inspections and Notices of Work

Mine Type	Number of Inspections	Number of Notices of Work
Coal - Surface	0	0
Coal - Underground	0	0
Exploration - Surface	74	88
Exploration - Underground	12	10
Industrial Minerals - Surface	2	0
Industrial Minerals - Underground	1	0
Metal - Surface	2	0
Metal - Underground	5	0
Placer - Surface	9	22
Placer - Underground	0	0
Sand and Gravel	51	11
Quarries	3	1
Abandoned	1	0
Other	0	0
Total	160	132

4.4.6. Summary of Activities

An auxiliary Inspector of Mines was employed from May to November for the inspection of surface exploration projects, gravel pits and placer operations in Districts 5, 6 and 12. The inspector, whose time was shared between the Fernie and Nelson regional offices, focused on the environmental aspects of these projects.

Enforcement Action:
On December 18, 1991, Kokanee Exploration Ltd., pleaded guilty to unlawfully commencing work without having obtained a permit, contrary to Section 10(1) of the *Mines Act*, and a fine of $5,000 was levied. The charges were filed by the District Inspector following unapproved surface exploration diamond drilling activity which resulted in drilling mud and compounds entering a stream which constituted the domestic water supply for downstream residents.

Safety Competitions:
At the awards dinner in Nelson on March 13, 1992, Bethlehem Resources' Goldstream Mine of Revelstoke, B.C. was the recipient of the 41st annual presentation of the West Kootenay Mine Safety Association's award for the Safest Small Underground Mine in British Columbia. The award was presented to Mr. Bill Shuttleworth, Safety Director of the Goldstream Mine and Grant Boruk Safety Committee Chairman. The safety record for this mine in 1991 was four lost time accidents resulting in 29 lost work days for an accident frequency rate of 4.16 per 200,000 manhours.

4.5. PRINCE GEORGE REGIONAL OFFICE

4.5.1. Office Address

1652 Quinn Street, Prince George, B.C., V2N 1X3.
Tel: (604) 565-6125 Fax: (604) 565-6015

4.5.2. Office Personnel

During the year, office personnel included:

D. Turner	District Inspector and Resident Engineer, District 9
S.E. Wuschke	District Inspector and Resident Engineer, District 13
J.J. Sutherland	District Inspector of Mines, District 10
D. Miller	District Inspector of Mines, District 11
N. Wood	Secretary
J. Rivers	Office Assistant
R. Legg	Office Assistant (aux)
C. Scofield	Office Assistant (aux)

4.5.3. Area of Responsibility

The Prince George Regional Office is responsible for Inspection Districts #9, #10, #11 and #13 (see Map 1) covering the northeast quarter of the province.

4.5.4. Inspection District #9

OPERATING METAL OR COAL MINES:

BULLMOOSE

Lat.55°17' Long.121°26' (93P/3W)

The Bullmoose open pit coal mine is located 87 km south of Chetwynd, B.C., and 35 km northwest of Tumbler Ridge, B.C. It is accessed by following Highway 29 to Kilometre 71, then west along Bullmoose Creek for 18.5 km.

The Bullmoose joint venture is owned 61% by Teck Corporation, 29% by Rio Algom Ltd., and 10% by Nissho Iwai of Japan. The operator is the Bullmoose Operating Corporation, 200 Burrard Street, Vancouver, B.C. V6C 3L9.

A minimum of six coal seams occur in the Lower-Upper Cretaceous Gates Formation (approximately 200 metres thick) of the Fort St. John Group, interbedded with sandstone, shale, and minor pebble conglomerates deposited in a deltaic setting. The sediments form a prominent broad syncline plunging gently northwest. In the Mount Chamberlain area the fold is asymmetrical (the west flank dips up to 70 degrees, the east flank dips at less than 20 degrees). To the south, the dips on both limbs are more gentle where the West and South Fork areas lie along the axial portion of the fold, with dips less than 20 degrees. A northwest trending thrust fault at West Fork dips southwest and shows appreciably large displacement. A thrust fault at South Fork appears to show little displacement.

This is a conventional truck and shovel operation. After treatment in the preparation plant, the coal is transported 35 km by truck to rail load-out silos 5 km from the town of Tumbler Ridge, from where it is hauled by unit train to the port at Ridley Island. The coal is sold to Japanese steel companies under contracts which provide for shipments of 1.7 million tonnes/year until 1999.

The operation has shipped over 14 million tonnes of metallurgical coal since production commenced in 1984. The company reports the mine has adequate reserves to satisfy existing contracts.

A new base price for Bullmoose coal was set at Cdn $88.26/tonne, effective April 1, 1991. The next price review is set to take place before April 1, 1993.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1981-1985, pp.75-76; 1986-1987 p.73; 1988, p.73

----------. *Annual Report*. Engineering & Inspection Branch. 1989, p.41; 1990, p.52.

Teck Corporation, perscom. 06/01/1992.

Minfile 93P-1,12,16.

QUINTETTE

Lat.55°01' Long.121°13' (93P/3E)

The Quintette coal open pit mine site is located 120 km south of Chetwynd, B.C., and 12 km west of Tumbler Ridge, B.C. It is accessed either by Highway 29, or by the Heritage Highway through Tumbler Ridge, to the Quintette plant site.

In July, 1991 management of the mine was taken over by Teck Corporation, 200 Burrard Street, Vancouver, B.C., V6C 3L9.

The Lower-Upper Cretaceous Middle Gates Formation (Fort St.John Group) consisting of sandstone, shale, siltstone, conglomerate and coal has been folded into a series of northwest trending open folds with associated low angle thrust faults. Major regional thrusts, the Mesa and Sheriff faults, locally displace the Gates Formation over the Hulcross Formation (Fort St.John Group). The four main coal seams in the Mesa pit are D, E, G and J seams. Seam D, the uppermost, contains a few sporadically developed thin shale partings and basal coal splits and thins to the southeast and is not considered economic. Seam E and F, 8.4 metres thick, contains many sporadic shale partings and has a consistently developed split E4, 1.8 to 4.4 metres below the main seam. The G seam, 0.9 metres thick, contains a rock parting and coal split in the upper portion in the southeast. Seam J, 8.9 metres thick, is well-developed and contains a few distinct shale partings in the southeast and represents the main target in the Mesa pit. These seams are restricted to the Middle Gates Formation. The coal-bearing sequence is capped to the northwest and in the south central areas by up to 40 metres of Lower Cretaceous "Babcock Member" conglomerate and conglomeratic sandstones. The Quintette operations also include the Wolverine and Shikano pits.

The Quintette Mine commenced production in 1983. This is a conventional truck and shovel operation for both waste removal and coal recovery. The mine produces metallurgical coal which is sold to a consortium of Japanese steel manufacturers under long-term contract.

Raw coal is transported from the Mesa/Wolverine pits to the process facilities via a 13.3 km overland conveyor and from the Shikano pit by bellydump trucks. The raw coal is delivered to three 8,000 tonne

capacity raw coal silos. From the silos, the coal is transported by conveyor to the process facilities, where it is screened, washed and dried to meet contract specifications. Cleaned coal is conveyed for storage in three 12,500 tonne capacity clean coal silos or, when necessary, stockpiled prior to shipment.

Clean coal is transported to Ridley Terminals in unit trains of 100 ninety-tonne gondola cars, which are loaded continuously and automatically. After loading, the rail cars are sprayed with a latex emulsion to minimize dust loss during transportation. The trains then travel 129 km on an electrified branch line to Anzac, followed by 124 km from Anzac to Prince George, and an additional 740 km from Prince George to Ridley Terminals at Prince Rupert. At Ridley Terminals, the coal is stockpiled and loaded into ships for transport to Japan.

On July 15, 1991 Teck Corporation took over management of the mine from Denison Mines Ltd. The management change was approved by Quintette's board of directors subject to certain conditions, including an agreement from Japanese steel mills that Denison will be relieved of any future obligations. Denison has a 50 percent interest in Quintette; a consortium of Japanese steel mills and trading houses has a 38 percent stake, and state-owned Charbonnages de France has the remaining 12 percent.

Base price renewal talks between Quintette and its Japanese customers were settled on August 23, 1991. The new price of Cdn $87.27 per tonne, effective April 1, 1991, is $4.83 higher than the price imposed by an arbitration board in May, 1990. Beginning April 1, 1992, the price will drop $0.80, and in the following two years, the price will be $85.17, a further drop of $2.10.

During 1991, the mine employed over 1,400 people, the largest number of workers for any mine in the Province.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1981-1985, pp.77-78; 1986-1987, pp.74-75; 1988 p.75.

_____. *Annual Report*. Engineering & Inspection Branch. 1989 p.41; 1990 p.53.

_____. *Mineral Market Update*, 1991. Vol.3 Nos. 1,2,3,4.

Mining Association of British Columbia. *Newsletter*. August, 1991. p.13.

Teck Corporation, perscom. 06/01/1992

Minfile 93I/10,11, Minfile 93P/19,20.

NON-OPERATING MINES/MINE CLOSURES:

There were no reported closures in 1991.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

As referred to in 4.5.9 Summary of Activities.

4.5.5. Inspection District #10

OPERATING METAL OR COAL MINES:

GIBRALTAR

Lat.52°30' Long.122°16' (93B/9W)

The property is located approximately 161 km south of Prince George, B.C., and 16 km east of McLeese Lake, B.C., on the west side of Granite Mountain by Granite Creek. Access is via a 16 km. paved road which connects to Highway 97 near the north end of McLeese Lake.

The operation is 68.1% owned by Placer Dome Inc., Gibraltar Mine Division, P.O. Box 49330, Bentall Postal Station, 1600–1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

The ore zone is a copper–rich porphyry deposit, occurring within a Triassic pluton of variable composition. The mine phase, which contains the ore zone, is a quartz diorite that has been altered and deformed. Mineralization took place during a complex history of deformation which involved the folding of mineralized foliations. Four orebodies are known: Gibraltar East, Gibraltar West, Granite Lake, and Pollyanna. Ore minerals are chalcopyrite and molybdenite; however, the Gibraltar East and Pollyanna pits have well–defined zones containing supergene chalcocite.

The Gibraltar property was discovered in 1927 and was known as the Hill property; the Polyanna was discovered in 1910 and known as the Rainbow Group. The Gibraltar and Pollyana properties were for the most part explored separately until 1969, at which time they received a combined exploration program. At year–end 1991, proven and probable reserves were 165.8 million tons grading 0.31% copper and 0.009% molybdenum.

The mine, which is a large open–pit copper operation, first began production in 1972. It produces copper and molybdenum in concentrate as well as refined copper from dump leaching and electrowinning, and in 1992 celebrates its 20th year in production.

In 1991 production of copper in concentrate was at the same level as in 1990. Higher throughput and head grade were offset, however, by lower recoveries as a result of higher production of oxide ore in the millfeed. Production of refined copper from leaching waste dumps, at 7.3 million pounds, was lower due to lower grade solutions. Trenching of dumps to evaluate solution percolation problems and testing of methods is being undertaken by the company to improve productivity. A combination of low prices and low head grades made production of molybdenum temporarily uneconomic for a period of time during 1991, resulting in a sharp decrease in production.

The company reports that the introduction of larger mining equipment in 1991, in the form of a 40 cubic yard shovel and six 240–ton trucks, will have a significant beneficial impact on mining costs.

In line with Provincial reclamation permitting requirements, during the year, the company submitted a comprehensive closure plan to the Ministry of the Environment.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, Vol.1, 1975–1980, pp.3–4; 1981–1985, pp.3–4; 1986–1987, pp.45–46; 1988 p.43.
_____. *Annual Report*. Engineering & Inspection Branch. 1989 p.41; 1990 p.54.
_____. *Mineral Market Update*, 1991. Vol.3. Nos. 3 and 4.
Placer Dome Inc., *1991 Annual Report*
Minfile 93B–6, 7, 12, 13.

NON–OPERATING MINES/MINE CLOSURES:

There were no reported closures during 1991.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Frasergold	Gold,Silver	52°20'N, 120°35'W	Eureka Resources Ltd.	Surface drilling; underground bulk test.

4.5.6. Inspection District #11

OPERATING METAL OR COAL MINES:
There were no major mines operating in the district in 1991.

NON-OPERATING MINES/MINE CLOSURES:
Mosquito Creek (53°03'N, 121°36'W): This underground gold mine, which was placed on a care and maintenance basis in 1987, remained inoperative in 1991.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:
As referred to in 4.5.9 Summary of Activities.

4.5.7. Inspection District #13

OPERATING METAL OR COAL MINES:

ENDAKO

Lat.54°02' Long.125°07' (93K/3E)

The open pit molybdenum mine is located ten km southwest of Endako, B.C., and 160 km west of Prince George, B.C., north of the east end of François Lake. Access is via paved road from Highway 16 just east of Endako.

The mine is owned by Placer Dome Inc., Endako Mines Division, P.O. Box 49330, Bentall Postal Station, 1600-1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

This is an irregular and elongated orebody in Endako quartz monzonite, part of the Topley intrusions of Jurassic age. There has been pervasive kaolinization of the Endako quartz monzonite, which is intruded by a variety of premineral dykes and by postmineral basalt dykes. Molybdenite, pyrite, magnetite, and chalcopyrite are closely associated with quartz in veins and fracture fillings. Ore minerals occur in major quartz-molybdenum veins 15 centimetres to one metre wide.

This open pit molybdenum mine, which commenced production in 1965, uses truck and shovel methods. Endako markets molybdic oxide and, through secondary processing, manufactures Ultrapure, which has a wide variety of applications, including use as a lubricant additive.

The mine, which is Canada's only primary molybdenum producer, celebrated its 25th year of operation in 1991. During the year, the concentrator operated at rated capacity, to produce 14.3 million pounds of molybdenum concentrate. At year end, reserves totalled 142.3 million tons, grading 0.082% molybdenum.

The company improved productivity and reduced operating costs in the mine with the addition of six new 190-ton haulage trucks and one new 19 cubic yard electric mining shovel. Mining rate increased by ten per cent, reflecting the peak stripping development of the Endako pit south wall.

The company reports that for 1992, it intends to take steps to reduce operating costs, improve productivity, minimize environmental impact and enhance quality control.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1975-1980, Vol.1, p.23; 1981-1985, p.16; 1986-1987, p.57-58; 1988 p.56.
_____. *Annual Report*, 1989, p.41; 1990 p.55.
_____. *Mineral Market Update*, 1991. Vol.3 No.3.
Placer Dome Inc. *1991 Annual Report*
Minfile 93K-6.

NON-OPERATING MINES/MINE CLOSURES:
No significant closures were reported during the year.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:
Refer to 4.5.9 Summary of Activities.

4.5.8. Volume of Inspections and Notices of Work

Mine Type	Number of Inspections	Number of Notices of Work
Coal - Surface	12	1
Coal - Underground	0	0
Exploration - Surface	109	155
Exploration - Underground	0	0
Industrial Minerals - Surface	0	0
Industrial Minerals - Underground	0	0
Metal - Surface	31	67
Metal - Underground	0	0
Placer - Surface	429	360
Placer - Underground	5	5
Sand and Gravel	32	8
Quarries	0	0
Abandoned	1	0
Other	0	0
Total	619	596

4.5.9. Summary of Activities

The Northeast Mine Development Review Committee operates from the Prince George Office. During 1991, the chair was occupied by S. Wuschke. The following large regional developments were reviewed during 1991:

- Mount Milligan - Placer Dome Inc. - Copper, gold open pit mine.
- Stronsay - Curragh Resources Inc. - Lead, zinc underground mine.
- Mount Polley - Imperial Metals Corp., International Corona Corp. - Copper, Gold mine.

4.6. SMITHERS REGIONAL OFFICE

4.6.1. Office Address

1st Floor - Courthouse Building, 3793 Alfred Avenue, Smithers, B.C., V0J 2N0.
Tel: (604) 847-7383 Fax: (604) 847-7603

4.6.2. Office Personnel

At year end, office personnel included:

D.W. Flynn	District Inspector and Resident Engineer/Office Administrator
B.H. Good	District Inspector and Resident Engineer
E.J. Hall	Inspector of Mines - Reclamation
B.A. Graff	Inspector of Mines - Environmental Impact Management
E.F. Mehr	Inspector of Mines
E.C. Konschuh	Secretary
G. Baker	Office Assistant
E. Burchett	Office Assistant
G.R. Oliarny	Office Assistant

4.6.3. Area of Responsibility

The Smithers Regional Office is responsible for Inspection Districts #1 and #2 (see Map 1), with D.W. Flynn the Inspector responsible for District #1 and B.H. Good responsible for District #2. The office administers the Branch's programs in the northwest quarter of the province, as well as the Queen Charlotte Islands.

4.6.4. Inspection District #1

OPERATING METAL OR COAL MINES:

GOLDEN BEAR

Lat.58°13' Long.132°17' (104K/01W)

This open pit gold/silver property is located 140 km west of Dease Lake, B.C. and 290 km northwest of Stewart, B.C.

The operation is owned and operated by North American Metals (B.C.) Inc., 1020-800 West Pender Street, Vancouver, B.C., V6C 2V6.

This is a replacement ore body. Gold occurs in silicified and breccia zones along a major fault between Permian limestones and upper Triassic andesites.

In 1988, the 140 km access road reached the site, and construction began on a permanent camp and plant foundations. In addition, the airstrip and roads on the property were upgraded and further drilling took place. The first gold bar was poured at Golden Bear in early February, 1990. Design capacity is 360 tonnes per day (tpd).

Effective March 5, 1991, the company announced modifications to its mine plan. Underground operations were suspended, resulting in 40 fewer employees. All ore was being mined from the open pit.

During 1991, about 90 workers were employed at the Golden Bear Mine.

References:

B. C. Ministry of Energy, Mines and Petroleum Resources. *Mining in British Columbia*. 1988 p.42.
_____. *Annual Report*. Engineering & Inspection Branch. 1989 p.45; 1990 p.57.
_____. *Mineral Market Update*. 1991 Vol.3 No.2.
Minfile 104KO79

PREMIER GOLD

Lat. 56°38' Long. 130°02' (104B/1E)

This open pit gold mine is located approximately 15 km north of Stewart, British Columbia.

The mine is owned and operated by Westmin Resources Ltd., Suite 904–1055 Dunsmuir Street, P.O. Box 49066, Vancouver, B.C. V7X 1C4.

The operation is comprised of the Silbak–Premier and Big Missouri properties which include the Premier, Dago, S1, Province and Martha Ellen deposits. The Silbak Premier, and to a lesser extent the Big Missouri properties, were the sites of previous underground operations that operated for many years during the period 1920–1960. The current open pit project began operating in 1989 and was designed to recover low grade gold/silver ore that extends to surface from the old Premier mine underground workings and from several pits on the Big Missouri property.

During the year, the company recalculated its ore reserves and revised them significantly downward. Increased strip ratios and lower ore reserves signify full depletion of the economical portion of the open pitable ore body by the second half of 1992. Effective March 15, 1991 the company announced a reduction in the workforce from 165 to 100 people. Milling rate was reduced from 2300 tpd to 1500 tpd. The company advised that future viability and life of the operation are contingent on a reconfirmation of the reduced ore reserves. Mine life could range from less than one year to more than five years depending on the reserve reconfirmation and the continuing investigations of new ore sources.

A new pit access road completed during the summer of 1991 led to further productivity improvements.

In the fall of 1991 Westmin reported it was pursuing a profit-sharing plan with employees. The company was also proceeding with production on Tenajon Resource's Ltd.'s SB property, to provide additional feed for the Premier mill. The company reports ore was successfully milled in the Premier mill such that the project could prove a stepping stone to similar ones in the future.

By December, 1991 the mine had recorded no lost time injuries since it started commissioning the property in 1989.

References:

B. C. Ministry of Energy, Mines and Petroleum Resources. *Annual Report* – Engineering & Inspection Branch. 1989 p.45; 1990 p.58.
_____. *Mineral Market Update*. 1991. Vol.3 No.1 and No.3.
Mining Association of British Columbia. *Newsletter*, February, 1992 p.7.
Westmin Resources Ltd. *Annual Report 1991*
Minfile 104B–054

SB (SILVER BUTTE) PROJECT

Lat.56°06' Long.130°01' (104B/01E)

The Silver Butte property is located within the Stewart mining camp between the gold-silver mines Silbak Premier to the south and Big Missouri slightly to the north.

The SB project was developed by the SB Joint Venture of Tenajon Resources Corp, with a 50% interest and Westmin Resources Limited, the operator with a 50% interest. Westmin Resources Limited is located at Suite 904 - 1055 Dunsmuir Street, P.O. Box 49066, The Bentall Centre, Vancouver, B.C. V7X 1C4. Tenajon Resources Corp. is at 860-625 Howe Street, Vancouver, B.C. V6C 2T6.

The property lies within the Stewart complex located in the intermontane tectonic belt, on the western edge of the Stikinia terrane adjacent to the Coast Plutonic Complex. The region contains rocks ranging in age from late Palaeozoic to Quaternary. Permian carbonates and Triassic volcanics form the basal units and are overlain by volcanics and sedimentary rocks of the Lower-Middle Jurassic Hazelton Group. Bowser Lake Group sediments of the Late Jurassic age overlie the Hazelton Group. Late Triassic to early Jurassic intrusive activity was followed by moderate deformation and regional metamorphism in the Cretaceous. Stocks and dykes intruded the region in the early to middle Eocene. Three main rock types are exposed at the Silver Butte occurrence: argillites and andesites of the Hazelton Group and granodiorite of the Jurassic Texas Creek Plutonic Suite. Five mineralized zones have been identified on the property: Facecut 35, West Kansas, Kansas and Anomaly. There are two styles of mineralization identified: high-sulphide, base metal-rich gold mineralization in the Facecut and 35 zones; and low-sulphide gold-rich mineralization in the Kansas zone. These are consistent with the two main vein types at Silbak Premier.

In August, 1991 Westmin reported results from the initial run of ore from the SB project through the Premier Mill. A total of 7,585 dry tons of ore mined from development headings was milled in a five day period, at a milling rate of 1,500 tons per day. Mill head grade was calculated at 0.29 oz. gold per ton, gold recovery achieved was 91.8%; gold production for the run totalled 2,025 troy ounces.

In August, mining and development on the SB property was continuing as planned. The next mill run was scheduled for late August when approximately 20,000 tons of ore was to be processed at a rate of up to 2,500 tons per day. The joint venture expected to mine and mill a total of 100,000 tons of ore before the end of 1991.

The operation closed on November 8, 1991. There were no stockpiles and no further mining was anticipated in the near future.

References:

Westmin Resources Ltd. *News Release*. March 5, 1991.
Northair Group. *First Gold Production at SB*. Press Release. August 1, 1991.
B.C. Ministry of Energy, Mines and Petroleum Resources. *Mineral Market Update*. Vol. 3 No.4.
Westmin Resources Ltd. *Annual Report 1991*
Minfile 104B-150.

SNIP MINE

Lat.56°40' Long.131°06' (104B/11E)

The Snip underground gold mine lies approximately 100 km northwest of Stewart, B.C., at the junction of Bronson Creek with the Iskut River.

Prime Resources Group Inc. (49.8% owned by International Corona by April 1991) has a 40% interest in the mine, while Cominco Ltd., holds the remaining interest and acts as operator. Cominco Ltd., is located at 2600 - 200 Granville Street, Vancouver, B.C V6C 2R2. International Corona Corporation is located at Suite 2500, 666 Burrard Street, Vancouver, B.C. V6C 2X8.

The Snip deposit is a mineralized shear zone that trends 120° and dips moderately to the southwest about 55°. Discordant mineralization, that cuts massive feldspathic wackes, comprises pyrite, pyrrhotite, chalcopyrite, sphalerite, galena and arsenopyrite. The ore is both massive and strongly foliated, quartz is commonly brecciated with a crackle texture. Mineralization is restricted to the shear zone and contacts with wallrock are sharp. Potassic alteration is represented by pervasive biotite-flooding and irregular K-feldspar (adularia) replacement of the wallrock.

The mine is developed by two adits on the west face of Johnny Mountain, at the 600-foot and 1,000-foot levels, and by a haulage way, driven from the Iskut River flats to the 400-foot level. Ore is mined using shrinkage stoping, and conventional and mechanized cut-and-fill methods.

Construction of the 330 tpd concentrator began in June 1990, and the underground mine officially opened on January 25, 1991. Ore reserves at start-up indicated a projected mine life of ten years, with an annual output of 2.9 million grams of gold. The mine started with 109 employees, rising to about 130 staff in 1991.

References:

B.C. Ministry of Energy, Mines and Petroleum Resources. *Annual Report*. Engineering & Inspection Branch. 1990 p.59.
_____. *Mineral Market Update*. 1991. Vol.3 No. 1 and No.2.
Mining Association of British Columbia. *Newsletter*. January, 1991.

MAJOR INDUSTRIAL MINERAL OR STRUCTURAL MATERIAL OPERATIONS:

CASSIAR MINE

Lat. 59°19' Long. 129°53' (104P/5W; 104P/5E)

The Cassiar underground asbestos mine is located on Mount McDame, approximately 4.8 km north of Cassiar, B.C. The plant site is nine km from Highway 37, roughly 120 km north of Dease Lake.

The property is owned and operated by the Cassiar Mining Corporation, which is a wholly-owned subsidiary of Princeton Mining Corporation, #2000-1055 West Hastings Street, Vancouver, B.C. V6E 3V3.

The orebody is in a sill-like mass of serpentinite, intrusive into Devonian-Mississipian sedimentary rocks. The orebody strikes north and dips 30°-40° to the east. Numerous veinlets of chrysotile asbestos occur in light to dark green serpentinite. Magnetite is fairly abundant, occurring in disseminated microscopic veinlets and larger aggregates. Other associated minerals include magnesite, brucite, and antigorite. On the hanging-wall, zones of zoisite-quartz-tremolite hornfels occur at the contact of serpentinite with argillites and contain local, irregular bodies of nephrite jade.

The Cassiar mine originally commenced production as an open-pit operation in 1953. 1990 was a transition year, as the mining of underground ore from the McDame deposit was phased in following the depletion of open pit ore stockpiles. Mining of the remaining recoverable ore from the pit was completed by May, 1990. All recoverable ore was delivered to the concentrator area by mid-July, at which time the tramline was shut down for relocation to the McDame portal elevation in preparation for underground ore.

The underground mining method selected was sub-level block caving, which is ideally suited for massive highly-fractured deposits. The method requires heavily supported drawpoints which are driven at regular intervals into the orebody footwall. The drawpoints are then undercut to initiate the cave process after which the ore flows by gravity. Rubber tired load-haul-dump machines deliver the ore to a centrally located crusher and orepass. The crushed material is conveyed to the transfer tower where it is trammed to the concentrator. The fibre is packaged, transported by road to the dock at Stewart, B.C., then barged to Vancouver, B.C. Sales are made to customers in 45 countries around the world.

Underground ore from the McDame deposit was brought on-stream in November, 1990. The initial ore contained oversize boulders which impeded delivery of ore through the delivery system. However, early in 1991, installation of a mineral sizer rectified this problem and continuous fibre production in excess of 300 tonnes per day was achieved.

Employees at Cassiar went on strike from March 4 to March 18, 1991 after failing to agree on the terms for a new contract with Princeton Mining Corp. Eventual ratification of a new two-year agreement was based on a commitment to improved union management cooperation; potential productivity efficiencies and cost-saving measures were to be reviewed by a joint performance committee, and employees were to share financially with the company in any resulting improvements.

In the fall of 1991, the company reported that ore delivered since the start of the McDame operation had been of considerably higher grade than the 5.6 percent projected in a feasibility study. New reserve calculations indicated an 18.9 million tonne deposit grading 6.1 percent recoverable fibre which would reduce annual development costs and extend mine life.

Hindrances to start-up operations at McDame (the labour strike, oversize ore, water inflows and poor ground conditions); however, contributed to financial difficulties for Princeton Mining Corporation. In September, 1991 Princeton raised $13 million by means of a private placement; $5 million of these funds intended for development of the McDame deposit. The British Columbia Supreme Court granted protection to Cassiar Mining Corporation on October 15, 1991. Under the court order Cassiar had 90 days to reorganize their financial structure. Cassiar applied for an extension to this in mid-January, 1992. Management advised the company needed additional capital of up to $17 million to enable further development of ore and that without further development the underground mine would be mined out within a year. In an effort to gain possible concessions, Cassiar, with the assistance of the Provincial Job Protection Commission, initiated negotiations with its buyers, the workers, and the government of British Columbia.

Cassiar directly employs over 350 people and is the sole support for the community of Cassiar.

References:
B.C. Ministry of Energy, Mines & Petroleum Resources, *Mining in British Columbia*, 1975-1980, Vol.1,p.41; 1981-1985, p.52; 1986-1987, p.78; 1988 p.78.
_____. *Annual Report*, Engineering & Inspection Branch; 1989 p.45; 1990 p.59.
_____. *Mineral Market Update*, 1991. Vol. 3 No 2, Nos 2, 3 and 4, 1992. Vol. 4 No. 1.
Minfile 104P-5; 104P-084.

NON-OPERATING MINES/MINE CLOSURES:

- **Erickson Gold**, Total Energold Corp., remains closed since 1988.
- **Johnny Mountain**, owned by Skyline Gold Corporation, remains closed since September, 1990.
- **SB Project**, operated by Westmin Resources Ltd., opened and closed in 1991.

- **Taurus Mine**, owned by International Taurus Resources Ltd., remained shut down.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Eskay Creek	Gold,Silver	56°37'N, 130°29'W	Int'l Corona Corporation	Underground and surface drilling program
Windy Craggy	Copper	59o44'N, 137°44'W	Geddes Resources Ltd.	Extensive surface and underground drilling program over the past four years.

4.6.5. Inspection District #2

OPERATING METAL AND COAL MINES:

BELL COPPER

Lat.55°00' Long.126°12' (93M/1E;93L/16)

The Bell open pit copper/gold property is located at the north end of the Newman Peninsula on Babine Lake, approximately 70 km northeast of Smithers, B.C., and 16 km north of Granisle, B.C.

The mine is owned by Noranda Minerals Inc., P.O. Box 45, Commerce Court West, Toronto, Ontario, M5L 1B6.

The Bell orebody is an elliptical intrusion of biotite feldspar porphyry, 730 by 365 metres in size. Copper mineralization occurs overlapping the western and northern contacts of the stock, giving the deposit a crescent shape. The sediments and volcanics are generally hornfelsed, and all units have undergone intense hydrothermal alteration. The mineralization is primarily chalcopyrite which occurs in a dense quartz stockwork as disseminations and fracture fillings. Pyrite forms from eight to fifteen per cent of the rock in the ore zone. Also, a zone of supergene enrichment exists, with chalcocite common as much as 60 metres below the surface. Assorted copper oxides and carbonates make up five to ten per cent of the total copper content of the upper part of the deposit. Minor amounts of gold and silver are associated with the chalcopyrite.

The Bell Copper operation commenced production in 1972. In 1991 the completion of a major drilling program at the perimeter of the pit indicated significant new ore reserves. Ore grades from the new reserves were somewhat lower than the present reserves. In addition, access to the new reserves, however, would require a significant push back of the pit walls.

In December, 1991 the company announced that it intended to reduce its workforce by 26 people from the current 261 on March 1, 1992. This announcement was in accordance with plans to suspend operations in mid-1992. An industrial adjustment service committee comprised of union and staff employees, mine management and representatives from the federal and provincial governments was established to assist laid-off workers with job search, job retraining and relocation. Laid-off employees are also to receive severance packages. The Bell Mine is the main industry in Granisle.

References:

British Columbia Ministry of Energy, Mines and Petroleum Resources. *Mining in British Columbia*. 1975-1980, Vol.1 pp.21-22; 1981-1985, p.15; 1986-1987, p.56-57; 1988 p.55.

_____. *Annual Report*. Engineering & Inspection Branch. 1989 p.46; 1990 p.61.

Mining Association of British Columbia. *Newsletter*. February, 1991; January, 1992.

Minfile 93M-1.

EQUITY SILVER

Lat.54°11' Long.126°16' (93L/1W)

The Equity open pit copper, gold, silver property is located 40 km southeast of Houston, B.C., and approximately 15 km north of François Lake.

The operation is 58.8% owned by Placer Dome Inc., P.O. Box 49330, Bentall Postal Station, 1600–1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

The ore zone is within a west-dipping dacitic volcanic pile of Mesozoic age. The Mesozoic rocks are intruded on the east by a Tertiary syenomonzonite stock. The base of the mine section is quartz pebble conglomerate, above which is a layer of dacite pyroclastic breccia. Silver-copper mineralization, in the form of tetrahedrite and chalcopyrite, occurs in 5–100 metre wide breccia zones, within host aphanitic, brittle tuffaceous rock. Accessory sulphides associated with the ore-bearing minerals are pyrite, galena, sphalerite and arsenopyrite. Proven and probable reserves at year-end 1991 were 2.5 million tons, grading 1.84 oz/ton silver, 0.22% copper, and 0.020 oz/ton gold.

Equity Silver Mine went into operation in 1980 using conventional open-pit methods. In 1990, silver production improved by 5% over 1989, reflecting higher grade ores and improved recoveries which also impacted favourably on gold production. The mine markets a silver-gold-copper concentrate to a Japanese smelter under a long-term contract effective for the remaining mine life. Bullion from a secondary recovery process is shipped to a refinery in eastern Canada. In 1991, production of silver, gold and copper dropped significantly as a high proportion of ore processed came from the lower grade Waterline pit and stockpiled ore.

With depletion of reserves, the mine moves towards closure of operations in the fourth quarter of 1992. On December 15, 1991 the company laid off nine employees in the mine and plant departments; further reductions are expected in 1992 but are contingent on attrition and business economics. Employees affected will receive a severance package upon termination. Equity is also providing career, relocation and financial counselling to assist employees in securing alternative employment.

In 1991, Equity deposited an additional $5 million as security for post-closure reclamation costs, as required by the Province. The company has now deposited a total of $31 million under the bond requirement. The amended reclamation permit requires that total security be increased to $37.5 million.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1975–1980, Vol.1, pp.24–25; 1981–1985, p.16; 1986–1987, p.58–59; 1988; 1988 p.57.

_____. *Annual Report*. Engineering & Inspection Branch. 1989 p.46; 1990 p.62.

_____. *Mineral Market Update*, 1991. Vol.3 Nos. 1, 3, 4.

Placer Dome Inc., *1991 Annual Report*

Minfile 93L-1.

LAWYERS (CHENI)

Lat.57°20' Long.127°12' (94E/6)

This underground silver and gold mine is located approximately 280 km north of Smithers, B.C., in the Toodoggone River area. Access is via the Omineca Mining Access Road which extends northwest from Moosedale to the mine site.

The operation is owned by Cheni Gold Mines Inc., #200-580 Hornby Street, Vancouver, B.C. V6C 3B6.

The eastern part of the property is underlain by quartz-andesite-crystal-lapilli-tuff which represents the remnant of a paleo-horst. The western part is underlain by volcano-sedimentary rocks of trachytic source, which represent a graben basin. Several gold-silver showings have been located, all associated with silicified filling of reactivated faults and fractures along the paleo-graben margins. The three main ore zones (the Amethyst Gold Breccia Zone, the Cliff Creek Breccia Zone, and the Duke's Ridge Zone) are all within, or near, the area of trachyte volcanism deposited west of the paleo-horst.

The mine commenced commercial production on March 1, 1989. During 1991, the mine was in a transition phase with production from the AGB Zone being replaced by ore from the Cliff Creek Zone. As a result, mill feed was marginally lower and head grades were significantly lower resulting in a 27% decrease in gold production and a 23% decrease in silver production compared to the first quarter of 1990. This situation resulted in higher operating costs. However, the company reported that work to access and develop the higher grade deposits on the Al claims north of the mine had gone well, and planned to blend 23,000 tons of the approximately 70,000 tons grading 0.39 ounces of gold per ton ore with the Cliff Creek ore for milling in the fourth quarter of 1991.

Result of underground development and definition diamond drilling on the Cliff Creek Zones, and fill-in drilling on the Duke's Ridge Zone, and recalculation of diluted and mineable reserves necessitated a reduction for the Cliff Creek North Zone to 153,707 tons grading 0.199 oz. gold per ton, and 5.79 oz. silver per ton. Fill-in drilling on the Duke's Ridge Zone resulted in a reduction of reserves to 23,991 tons grading 0.232 oz. gold and 6.33 oz. silver per ton.

The revision of reserves, combined with low gold and silver prices, forced the announcement by management in October, 1991 of eight weeks notice of termination to 95 employees. The company announced operations at the Lawyers property would continue on a reduced basis, using stockpiled ore, until such time as additional reserves had been proven or gold and silver prices increased significantly.

An exploration campaign on the J & L Project was completed in the summer of 1991. The Main Zone was traced through to the old Roseberry workings, 2.5 km to the west, and drilling confirmed continuity of the Yellowjacket Zone to the east. Metallurgical work was ongoing to pilot test the flotation portion of the process. The company is seeking the appropriate permits to mine additional reserves from deposits adjacent to the Lawyers property during the summer of 1992.

References:

B.C. Ministry of Energy, Mines & Petroleum Resources. *Mining in British Columbia*, 1981-1985, pp.17-18; 1986-1987, p.59-60; 1988 p.58.

_____. *Annual Report*. Engineering & Inspection Branch. 1989 p. 46; 1990 p.62.

Cheni Gold Mines Inc., *Press Releases*, 1991.

_____. *Interim Reports to Shareholders*, 1991.

Minfile 94E-66.

SHASTA MINE

Lat. 57°17' Long. 127°00' (94E/7)

The Shasta open pit and underground gold/silver mine is in the Toodoggone area.

The property is owned by International Shasta Resources Ltd., 1110, 625 Howe Street, Vancouver, B.C. V6C 2T6. The mill is owned by Sable Resources Ltd., of the same address.

The Shasta deposit is an epithermal multiphase quartz-carbonate stockwork/breccia vein deposit containing significant silver and gold mineralization. The deposit is spatially related to a dacitic dome of lower Middle Jurassic age. Significant mineralized zones are hosted by pyroclastic series rocks that were deposited on the flank of a coeval dacite dome. Eleven mineralized zones are recognized on the property. Exploration indicated that the Rainier, Cayley, Baker, Upper Rainier, JM and Creek Zones are all segments of a continuous vein system.

International Shasta submitted an MDRP prospectus in July 1989, which received approval-in-principle by November of that year. In the spring of 1990, the company went into production, trucking an average of 153 tpd to the old Baker mill owned by Sable Resources Ltd. Sable Resources reactivated and expanded the Baker concentrating facilities. The Shasta operation was expected to have a mine life of two to three years.

In 1991, the company was working the Multinational B-Zone; however, operations terminated on November 11, 1991 due to collapse of the portal to the underground mine. The mine was not expected to open again until April or May, 1992.

References:
B.C. Ministry of Energy, Mines and Petroleum Resources. *Annual Report.* Engineering & Inspection Branch, 1989 p. 47; 1990 p.63.

DOME MOUNTAIN (Free Gold)

Lat. 54o45' Long.126o34' (93L/10E)

This underground gold/silver property is located 32 kilometres east of Smithers, B.C., on the east slope of Dome Mountain.

The operation is a joint venture between Hapsburg Resources (formerly Teeshin Resources) and Timmins Nickel Inc., Bag 7000 Smithers, B.C. V0J 2N0.

Underground development at Dome Mountain is centred on the Boulder Creek vein, estimated to contain 294,800 tonnes grading 12.34 g/t gold and 80.2 g/t silver. The vein is typically one to two metres wide, strikes east-west and dips 60° south. Gold occurs as native metal but is rarely visible, with 10 - 40% pyrite-sphalerite-galena-chalcopyrite in the quartz-carbonate vein.

In 1991 the companies entered into a joint venture to develop the Dome Mountain mine. The fourth quarter of 1991 was devoted to production of bulk samples for milling tests at Equity Silver and Westmin's Premier gold mine. Production rates of 200 - 300 tonnes per day are expected.

References:
Minfile 93L-23

NON-OPERATING MINES/MINE CLOSURES:

Shasta Mine: International Sable Resource. Operations terminated on November 11, 1991 due to collapse of the underground mine, and were not expected to resume until April or May, 1992.

Granisle Mine: Noranda Minerals Inc. Plant site demolition was completed and reclamation was ongoing in 1991.

Wesfrob Mine (Tasu): Demolition and reclamation of the site was completed during the year.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company	Activity
Kemess	Copper	57o04'N, 126o47'W	Elcondor Resources	Major drilling program

4.6.6. Volume of Inspections and Notices of Work

Mine Type	Number of Inspections	Number of Notices of Work
Coal - Surface	0	0
Coal - Underground	0	0
Exploration - Surface	181	349
Exploration - Underground	2	3
Industrial Minerals - Surface	0	0
Industrial Minerals - Underground	0	0
Metal - Surface	40	1
Metal - Underground	39	1
Placer - Surface	104	72
Placer - Underground	0	0
Sand and Gravel	67	7
Quarries	0	0
Abandoned	4	0
Other	0	0
Total	437	433

4.6.7. Summary of Activities

The Northwest Mine Development Review Committee operates out of the Smithers office. In 1991, B. Good was Chairman. The following were prominent in the Committee's work during the year:

- The committee reviewed and approved the mining of the Tenajon SB Zone by Westmin Resources Ltd. and Tenajon Resources Ltd.
- Most reclamation permits for mines in the northwest were reviewed and amended during the year.

PART 5: HEALTH AND SAFETY STANDARDS AND SPECIAL PROJECTS

5.1. ENVIRONMENTAL CONTROL

Role and Responsibilities

The Environmental Control Section is charged with monitoring the workplace environment at metal mines, coal mines, and industrial mineral mines and quarries throughout the province. It ensures compliance with the Health, Safety and Reclamation Code for Mines in British Columbia with regard to the chemical, physical and radiated elements to which workers are exposed. Environmental Inspectors monitor factors such as underground mine ventilation, gases, dust, noise, lighting and radiation. The section is also responsible for training, examining and certifying audiometric technicians for the mining industry.

Structure and Organization

In 1991, the work of the section was carried out by three persons including the Section Head and two Environmental Control Inspectors.

Summary of Activities

During 1991, Environmental Inspectors made 48 detailed inspections which involved 30 different mining companies.

In cooperation with Westmin Resources Ltd., the section conducted a study to monitor scooptram operators for respirable combustible dust (RCD's), which took place for six weeks, January 22 to February 28, 1991. The CANMET Research Laboratories' Elliot Lake Method was employed to determine the RCD levels.

In conjunction with the U.S. Bureau of Mines and Simon Fraser University, the section continued to be involved in an extended hours of work study at the Myra Falls operations of Westmin Resources Ltd. Phase 2 of this study took place May 8 -17, 1991. The program consisted of volunteers from the mine who were previously working eight-hour shifts but who switched to twelve-hour shifts.

5.2 MECHANICAL ENGINEERING, ELECTRICAL ENGINEERING AND EMERGENCY PREPAREDNESS

Role and Responsibilities

Mechanical and electrical inspectors ensure that all mechanical and electrical equipment installed and used at mines complies with the *Mines Act* and applicable codes and standards, and that the equipment is maintained in acceptable condition such that its operation would cause no hazard to persons or property.

The emergency preparedness inspector ensures that all mines have an emergency preparedness plan capable of being implemented at any time to combat any emergency situation. Such plans are integrated with a province wide protocol to combat any emergencies which may require aid and assistance from outside of the mine at which the emergency occurs.

Structure and Organization

The section has seven staff comprised of engineers and technicians.

Summaries of Activities

(a) Mechanical Engineering:

Inspections were carried out at all of the major mining operations including the larger quarries, and sand and gravel plants. Some inspections were also performed at placer operations. The section is increasing its inspection of maintenance records, as well as inspections of equipment, in order to ensure that safety systems are maintained in accordance with Code requirements. Advances in technology are enhancing efficiency and safety of operation of equipment, but it places a high demand on the ability of personnel at the mines and in the Branch to ensure that such equipment is maintained properly.

Such technological advances became evident throughout the year, especially in the electronic control of large diesel engines. In addition to making the engines more efficient, and allowing for greater ease of monitoring, such engines are a great deal more environmentally friendly in that exhaust emissions, especially particulate matter, are reduced by efficient fuel/air management. The next few years will see an even more stringent limit on emissions of oxides of nitrogen and particulate matter emitted from diesel engines. Although such limits generally will apply to diesel engines operating in on-road vehicles, it is quite possible that such emissions from off-highway equipment may also be regulated. In order to reduce emissions of the soluble organic fraction of particulate matter, future diesel fuels will also have much lower sulphur levels.

The previous work that the section carried out with regard to the trapping of particulate matter in the exhaust systems of engines operating underground, will provide a foundation for evaluating the control of particulate emissions from much larger engines operating on surface.

Preliminary investigations were carried out into the effects of abrasion on equipment used at coal preparation plants. Another project enquired into the requirement for safety catches on conveyances installed at inclined shafts. A great deal of preparatory work was undertaken into the ventilation requirements for various diesel engines in operation in underground mines. This work will form the basis for a re-evaluation of all ventilation requirements for diesel engines operating underground, to be undertaken in 1992 when a threshold limit value for respirable combustible dust is expected to be included within the Health, Safety and Reclamation Code for Mines in British Columbia.

(b) Electrical Engineering:

The primary objective for 1991 was to conduct electrical inspections at all mine sites within the province. This was achieved with the exception of two remotely located mine sites where scheduled visits were postponed due to travel problems. In addition, inspections were carried out at a number of sand and gravel operations.

Of interest in 1991 was the delivery of the latest generation of electrical shovel to three open pit mines. These shovels with larger bucket volumes considerably increased the productivity rate of the operations concerned.

(c) Emergency Preparedness

Key functions of the Branch are to promote mine rescue, safety and first aid, and to provide assistance to the mining industry in these areas. This is done through training and certification; the provision of relevant publications; and the maintenance of mine rescue stations and equipment.

Regional mine rescue stations are located at Fernie, Victoria airport, Kamloops, and Smithers. The stations are under the supervision of the Regional Office Administrator/Resident Engineer in each region and the Mine Emergency Preparedness Co-ordinator in Victoria.

Due to the reduction in mine rescue staff following restructuring of the Branch, training in mine rescue is now conducted by the mining industry and/or other private agencies. Arrangements are underway to establish training programs at Cariboo College in Kamloops, and at the British Columbia Institute of Technology in Burnaby. To assist mine management in the transition to providing qualified mine rescue instructors, a mine rescue upgrading course was prepared by Branch Staff. Examining candidates and issuing certificates of proficiency in mine rescue work remains the responsibility of the Branch and is conducted by designated staff in Victoria, Prince George, Kamloops and Fernie.

Mine Rescue Certificates Issued, 1991

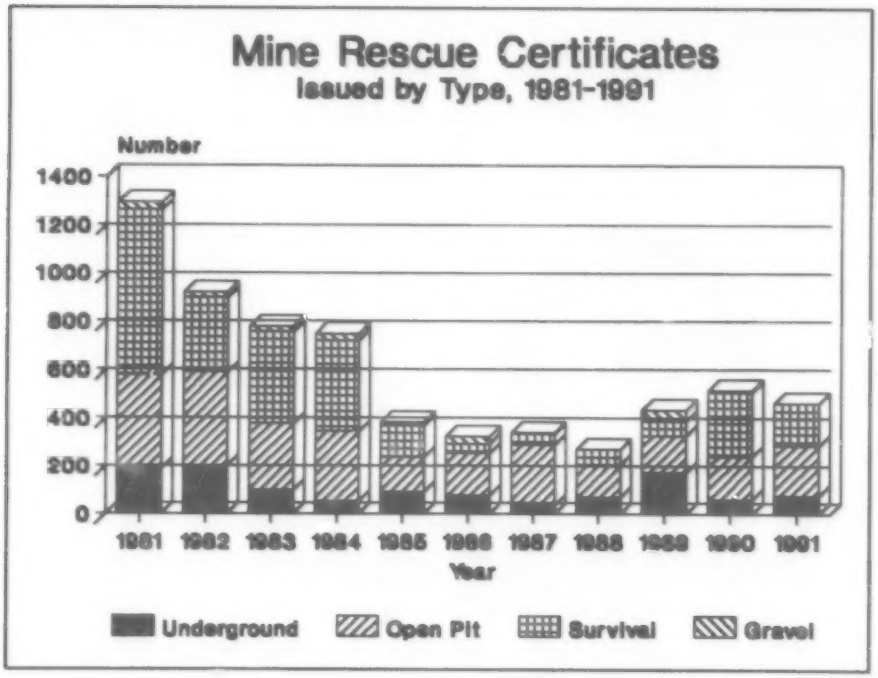
Type of Certificate	Number Issued
Survival mine rescue	177
Underground mine rescue	77
Surface (open pit) mine rescue	208
Gravel pit rescue	0
Advanced mine rescue seals	6
Total Certificates Issued	468

Mine Rescue Instructor Certificates Issued, 1991

Type	Number Issued	Re-Certified
Survival	0	0
Underground	7	0
Surface (Open Pit)	6	4
Total Instructor Certificates	13	4

Mine Rescue Certificates Issued, 1981-1991

Year	Underground	Surface	Survival	Gravel Pit	Total
1981	187	390	685	31	1,293
1982	198	390	308	21	917
1983	99	277	379	22	777
1984	52	290	376	28	746
1985	92	142	133	13	380
1986	76	175	40	30	321
1987	36	252	45	5	338
1988	69	134	65	0	268
1989	173	154	62	45	434
1990	61	179	268	7	515
1991	77	208	177	0	462
Total	1,120	2,591	2,538	202	6,451



As emergency and standard first training is now conducted by independent training agencies and associations, rather than the Ministry, statistics pertaining to such training have been discontinued in this publication.

Mine Rescue Stations and Equipment

A protocol agreement has been established between the Ministry of Energy, Mines and Petroleum Resources and the provincial Air Services Branch to provide air transport requirements for men and equipment in the event of a major underground or surface disaster within the province.

Underground mine rescue equipment owned by the Ministry of Energy, Mines and Petroleum Resources (MEMPR) and by industry in 1991 is shown in the following table.

Underground Mine Rescue Equipment, 1991

Item	MEMPR	Industry	Total
Draeger BG 174 breathing apparatus	43	68	111
Liquid oxygen flasks	21	5	26
Thermal cameras	1	1	2
Chemox breathing apparatus	37	8	45
Draeger Oxy SR 30 & 45 B.A.	41	28	69
Draeger Oxy SR 60 B.A.	0	2	2
Pressure Demand B.A.	20	30	50
Type 'N' gas masks	54	73	127
H.E. foam generators	0	6	6
Oxygen pumps	9	1	10
Draeger RZ 25 testers	5	6	11
Draeger RZ 35/40 testers	5	5	10

Mine Emergency Preparedness

The Branch has completed the final draft of two publications:

- The *Mine Emergency Management Plan* – for use by Ministry staff.
- The *Mine Emergency Response Plan* – for use by the mining industry.

The *Management Plan* is a concise guide for Ministry staff to follow upon notification by a control centre director at a mine of an incident which has progressed beyond the "containment" level and requires assistance. The *Emergency Response Plan* is a guideline for the mining industry to aid in compiling their mine emergency response and evacuation criteria.

To establish a cohesive emergency response network and continuity in mutual aid throughout British Columbia, the Branch's Mine Emergency Co-ordinator is working with labour and mine management at participating mines, by integrating the *Management Plan* and customized *Response Plans*.

Mine Safety Associations

Five mine safety associations, sponsored by the Ministry of Energy, Mines and Petroleum Resources and the Workers' Compensation Board, continued to operate in different areas of the province. These associations are:

- The Vancouver Island Mine and Industrial Safety Association;
- The East Kootenay Mine and Industrial Safety Association;
- The West Kootenay Mine and Industrial Safety Association;
- The South Central B.C. Mine Safety Association; and
- The North B.C. Mine Safety Association.

These associations consist of representatives from industry, the Resource Management Branch, the Workers' Compensation Board and St. John's Ambulance. Each association promotes mine rescue training, first aid training and safety education in its district.

5.3. PROVINCIAL MINING COMPANIES - COMPETITIONS AND AWARDS

A primary mandate of the Resource Management Branch is to ensure worker health and safety, public safety, and suitable reclamation and protection of the land and watercourses affected by mining and exploration work. The *Mines Act* and the Health, Safety and Reclamation Code stipulate the legal responsibility of provincial mining companies in meeting this mandate; however, many British Columbia mining companies and their individual workers voluntarily and consistently exceed these legal requirements. Through the efforts of these individuals, companies and staff of MEMPR, mining is now British Columbia's safest heavy industry.

Mine rescue competitions, first-aid competitions, and safety awards all contribute to the overall climate of safety. Reclamation awards acknowledge those companies which go beyond what is called for in their mining plans by conducting superior research and introducing innovative techniques to restore the land.

5.3.1. Mine Rescue Competitions

The provincial mine rescue competitions are judged by MEMPR's mine inspectors, as well as industry personnel, who are responsible for all aspects of worker and public safety in B.C.'s mining industry. This year's competition was held in Nanaimo on June 15, 1991:

- **Surface Mine Rescue Champions**
  The six open pit teams which participated, and which had previously qualified by placing first and second in the three mine rescue zone competitions were: Gibraltar Mines Ltd; Highland Valley Copper; Crows Nest Resources' Line Creek Mine; Westar Mining Ltd's Balmer and Greenhills operations; Quintette Coal Ltd; and Equity Silver Mines Ltd.

  Gibraltar Mines Ltd. became the 1991 provincial surface mine rescue champions. Gibraltar's team members were Murray Canfield, Paul Porteous, Kirk Everard, Marck Petersen, Rene Liebart, Kerry Harford, Dennis Krell and Doug Hopp.

- **Underground Mine Rescue Champions**
  Underground teams do not have zone competitions and compete directly in the provincial event. Four teams competed in the 1991 underground mine rescue competition: Westmin Resources Ltd's Myra Falls operations; Cominco Ltd's Sullivan Mine and Snip Mine; and Cassiar Mining Corporation's McDame Project.

  The **Cominco Sullivan Mine** team became the 1991 provincial underground mine rescue champions. Sullivan's team members were Stan Smith, Ron Vanootagham, Bill Bloomer, Dave Varty, Merve Haney, Mike Plait, Mike Cook and Bill Fudicoff.

- **Canadian Championships**
  In 1986, British Columbia hosted a Canadian Mine Rescue Championship. Unfortunately, since that year, the other Provinces and Territories have not been in position to participate in a national competition.

In order to promote the mutual aid mine rescue concept and to ensure at least one representatives at national conferences, the Canadian Championships Committee created three regional committees with representation as follows:

East	Central	West
New Brunswick	Quebec	Alberta
Nova Scotia	Ontario	British Columbia
Newfoundland	Manitoba	Yukon
	Saskatchewan	Northwest Territories

The Regional Committees will each meet on a semi-annual basis. Based on economic restraint, only one representative from each Regional Committee will attend a national meeting.

The Western Regional Committee is presently endeavouring to:

- Review existing rescue capabilities.
- Develop a mutual aid agreement for Western Canada.
- Encourage interaction between rescue workers, mining companies and government jurisdictions through the establishment of Western Canada regional mine rescue competitions for underground and surface mines.

5.3.2. Underground Bench Competition

The Provincial Underground Bench Competition was instituted in 1978. Competing teams must demonstrate their proficiency in the examination and testing of their apparatus prior to use. The event is in memory of the late B. Abbott, captain of the Cominco Ltd. H.B. mine rescue team in 1976 which won the Canadian Underground Mine Rescue Competition that year.

In 1991, this competition was won by Westmin Resources Ltd's Myra Falls Operation: Paul Stentaford, Captain. .

5.3.3. Safety Competitions

Small Mines

In 1991, the West Kootenay Mine and Industrial Safety Association Trophy for Safest Small Underground Mine in British Columbia was won by Bethlehem Resources' Goldstream Mine near Revelstoke, B.C.

The trophy was donated by the West Kootenay Mine and Industrial Safety Association in 1951 to encourage and promote safety in small mines. Since 1956, the competition has been open to qualifying mines throughout the province. The award is given to the mine having the lowest compensable accident rate after working from 2,500 to 30,000 shifts per year, at least one third of which were underground. The mine must have operated for at least nine months during the calender year. A fatality automatically disqualifies a mine for that year.

The Goldstream Mine won the award with an accident frequency of 4.16 per 200,000 manhours. Other qualifying small mines for the competition were:

Mine	Frequency Rate
Silvana Mine	59.32
Parson Barite Mine	34.83
Golden Bear Mine	10.93

At the awards dinner in the Heritage Hotel in Nelson, Greg McKillop, on behalf of MEMPR, presented the award to Safety Director Bill Shuttleworth, and Mine Safety Committee Chairman, Grant Boruk.

Open Pit Mines and Quarries

Awards were presented by The Honourable Anne Edwards, Minister of Energy, Mines and Petroleum Resources at the 30th Annual Safety Awards banquet held at the Hotel Vancouver on March 12, 1992 during B.C.'s mining week. The awards dinner is sponsored annually by the Resource Management Branch. This year, the Minister was on hand to stress the importance of safety in the workplace, to compliment the fine safety record of the B.C. mining industry, and to personally congratulate the winners for their outstanding records. Master of ceremonies for the evening was Chief Inspector, Ralph McGinn.

- The John Ash Award is presented to the mine which has worked over 1,000,000 hours. In 1991, **Highland Valley Copper Corporation** was the winner, and has now won the award for the past four years, beginning in 1989.

- The Edward Gawler Safety Award for 200,000 to 1,000,000 hours worked, went to **International Corona Corporation's Nickel Plate Mine**, which they also won last year.

- The Stewart O'Brian Safety Award for 35,000 to 200,000 man hours worked went to **Baymag Mines Co. Ltd. Quarry, and Steelhead Aggregates Ltd., Chilliwack Division.**

- Safety Certificates for 15,000 to 35,000 hours worked went to **Allard Contractors Ltd. - Haney Pit; Continental Lime Ltd. - Pavilion; Westroc Industries Ltd. - open pit; and Clayburn Industries Ltd.**

(Prior to 1991, the trophies had no names ascribed to them, but were referred to as A, B, and C. To commemorate personalities in the early Ministry of Mines, the 'C' Trophy has been named after John Ash - the first Minister of Mines appointed in 1874, the 'B' Trophy is after Edward Prior - first Inspector of Mines in 1877, and the 'A' Trophy commemorates Stewart O'Brian, one of the first mine rescue instructors appointed in 1912).

Joint Occupational Health and Safety Committee

In 1991, the Resource Management Branch initiated an award for the joint occupational health and safety committee which demonstrated excellence in its operation, innovative approaches to enhance worker safety awareness and/or significant improvements in co-operative internal responsibility for safety at a mine. Mine managers, mine supervisors and mine workers were encouraged to nominate their O.H.S.C. and submit documentation in support of the achievements.

The first awards were presented by The Honourable Anne Edwards at the March 1992 Annual Mine Safety Awards Banquet to **BHP Utah Mines Ltd. - Island Copper Mine, and Westar Mining Ltd. - Greenhills Mine.**

National Safety Awards (John T. Ryan Trophies)

The John T. Ryan safety trophies were established in 1941 by the Mine Safety Appliance Company of Canada Limited to promote safety in Canadian metalliferous and coal mines. The administration of these annual awards is conducted by the Canadian Institute of Mining and Metallurgy.

Over the years there have been a number of changes in the regulations and qualifications; there are now three categories open for annual competition.

1. Metalliferous Underground Mines – includes a Canadian trophy and four regional trophies. B.C. mines compete in the B.C. and Yukon Region.

2. Select Mines – includes open pit and strip mines for any mineral including coal. This has a Canadian trophy and two regional trophies. B.C. mines compete in the Western Region which includes all Canada west of the Manitoba–Ontario border.

3. Coal Mines – restricted to underground mines. There is a single Canadian trophy in this category.

Applications for these awards are submitted annually through the Chief Inspector of Mines. Awards are presented to the company or companies having the least number of compensable accidents in a continuous period in which 500,000 man–hours (120,000 for underground coal mines) of employment are recorded. If the 500,000 man–hours cannot be achieved in one year, they may be accumulated over a longer continuous time period but the complete calendar year must be included. No portion of that period may be used in another application for the same award. A fatality causes automatic disqualification for the period in which it occurs.

For 1991, trophy winners were as follows:

Select Mines, Canadian Trophy:
- Fundy Gypsum Company, Nova Scotia.

Select Mines, Regional Trophy:
- Potash Corporation of Saskatchewan Inc., Rovanville Division

Metalliferous Underground Mines, Canadian Trophy:
- Falconbridge Ltd., – Kidd Creek Mine, Ontario.

Metalliferous Underground Mines, Regional Trophy:
- No trophy was awarded in 1991.

Coal Mines
- Curragh Resources, Westray Coal Mine, Nova Scotia.

5.3.4. First Aid Competitions

In 1976 a three–person first aid team became the competitive standard, and the first Provincial Three–Persons Miners' First Aid event was held in 1978. First aid training is designed to aid a fellow worker in the event of an accident at the workplace; thus, the competition simulates this situation. One team member acts as the patient and the other two render first aid. The St. John Standard course was adopted as the training standard and only those who work in or about a mine are permitted to enter.

The Provincial First Aid Competitions were held in Nanaimo on June 15, 1991 in conjunction with the Provincial Mine Rescue Competitions. The five teams competing for the award were Gibraltar Mines Ltd; Westar Mining Ltd's Balmer mine; B.C. Hydro's "B" Team; Bullmoose Operating Corporation; and Cominco Ltd's Sullivan No.1 Team. The 1991 provincial first aid champions were **Cominco's Sullivan Mine.**

5.3.5. Reclamation Awards

In 1977 the first annual mine reclamation symposium was held to provide a forum for members of industry, government and the academic community to exchange views and ideas. The first annual mine reclamation award was presented at this symposium.

The fifteenth annual mine reclamation symposium was held in Kamloops June 24 - 28, 1991. At the awards dinner, Six British Columbia mining companies received recognition and awards for mine reclamation work carried out at their operations, with **Brenda Mines**, the recently closed operation in the Okanagan, winning the top award. The other 1991 award winners included:

- **Total Energold Corporation** - Metal Mining Citation
- **Westar Mining Limited** - Coal Mining Citation
- **Preido Mines** - Placer Mine Citation
- **Polestar Exploration Incorporated** - Exploration Citation
- **Butler Brothers Limited** - Sand and Gravel Citation.

The annual $1,000 Jake McDonald Memorial Scholarship was won by **Annette Rohr** of **Westmin's Myra Falls Operation**. The scholarship is given in honour of Jake McDonald, former Senior Reclamation Inspector and founder of the reclamation symposium. The award goes to a student in a scientific field related to reclamation.

5.4. EXAMINATIONS AND CERTIFICATIONS

5.4.1. Shiftboss Certificates

Section 24 of the Mines Act requires that every person employed underground or in open pit workings must be under the daily supervision of an official who is the holder of a shiftboss certificate issued under the Act. In addition, section 32 of the Mines Act specifies that every person employed in open pit workings at a coal mine be under the daily supervision of a shiftboss or other official who is the holder of an open pit shiftboss certificate issued under the Act.

An applicant for a shiftboss certificate must hold a non-restricted blasting certificate (gravel pits excluded), a mine rescue certificate (surface or underground as requisite), and a currently valid first-aid certificate. The applicant must also pass an examination on the rules and regulations contained in the respective Acts.

Four different certificates are issued: for underground metal mining operations; for open pit coal mining operations; for open pit metal mining operations; and for sand-, gravel- and clay-removal operations. A fee of $50 is charged for the examination and the passing grade is 65%. Provisional certificates may be issued on a one-time basis for a period of six months.

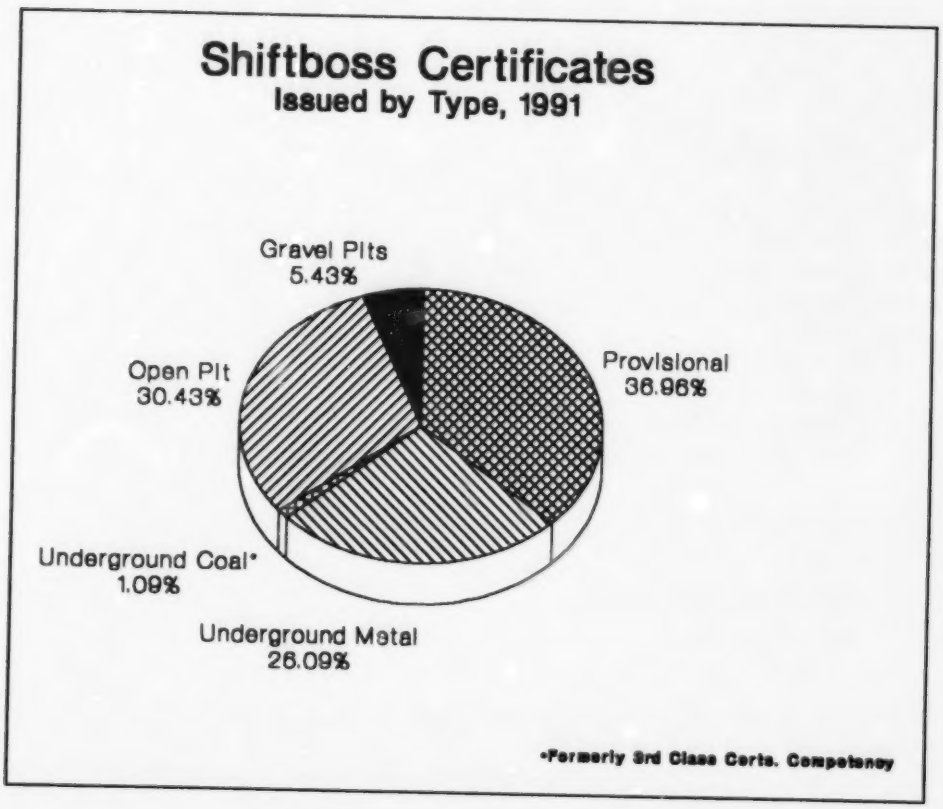
Certifications for 1991 are detailed in the following tables.

Total Shiftboss Certification Activity, 1991

Activity	Number
Applications received	115
Examinations written	73
Number passed	62
Number of permanent certificates issued	58

Shiftboss Certificates Issued by Type, 1991

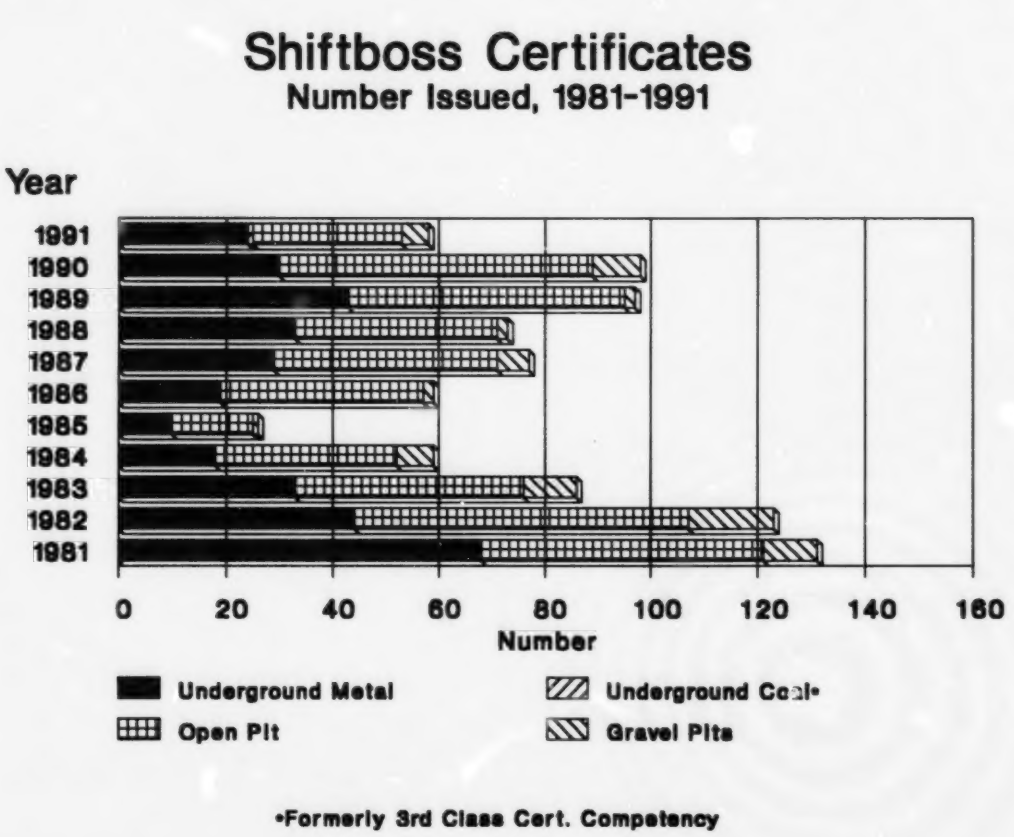
Type of Certificate	Number
Underground metal	24
Underground coal	1
Open pit	28
Gravel pits	5
Provisional certificates	47



The following Shiftboss Certificates were issued during the last decade:

Shiftboss Certificates Issued by Type, 1981-1991

Type	Year										
	81	82	83	84	85	86	87	88	89	90	91
Underground Metal	68	44	33	18	10	19	29	33	43	30	24
Underground Coal (formerly Third Class Certificate of Competency)											1
Open Pit	53	63	43	34	15	38	42	38	52	59	28
Gravel Pits	10	16	10	7	1	2	6	2	2	9	5
Total	131	123	86	59	26	59	77	73	97	98	58



5.4.2. Certification of Supervisors at Coal Mines

Part 1 of the *Health, Safety and Reclamation Code* requires that managers and certain other supervisory officials at underground coal mines shall be holders of Certificates of Competency or Underground Shiftboss Certificates. The Code also requires that supervisors at open pit coal mines hold either Shiftboss Certificates or appropriate Supervisors Certificates. A Board of Examiners, appointed by the Minister, is responsible for setting examinations for these certificates, for considering applications for interchange certificates, and for issuing certificates.

5.4.3. Board of Examiners

The Board of Examiners comprises the Chief Inspector as chairman and two other inspectors appointed by the Minister as members. In 1991, R.W. McGinn chaired the Board, with R. Bone and E. Sadar were members, and R. Booth and B. Good as alternates.

PART 6: ACCIDENTS AND INCIDENTS

6.1. FATAL ACCIDENTS

There were three mining-related fatal accidents in the Province in 1991:

Robert Verbreek, 48 years old, and a general surface worker at the **Endako** Mine, was fatally injured on February 13, 1991, while attempting to undo a shackle from a web sling which was connecting a pipe 34 metres long and 83 centimetres in diameter, to the bucket of a 980-C front-end loader. Mr. Verbreek was pinned between the pipe and the bucket and crushed in the chest area.

The District Inspector of Mines who investigated the fatality recommended that consideration be given to whether lifting material with a sling and bucket of a front-end loader should continue to be an acceptable practice on this site, especially with a loader of the size involved in this accident, whereby the bucket blocks the operator's view of a person working on the sling. Machines with bucket sizes of two yards or less, and a minimum length sling would be acceptable.

Terrance Donn Miller, 37 years old and a serviceman at Westar Mines Ltd's **Balmer** operation, was fatally injured in an unwitnessed accident on March 26, 1991, while he was inspecting belting and transfer equipment.

Since the accident was unwitnessed, it was the consensus of the committee who investigated the accident that a part of the person, clothing, or a radar light being carried by, the deceased, came into contact with a high speed belt conveyor (259 m.p.m.) in the vicinity of the drive pulley, thus drawing him into the conveyor drive. The deceased was discovered trapped between a fixed steel beam and a stationary high speed belt where it came in contact with the drive pulley.

The investigating committee recommended the following:

1. Guards must be improved and extended at all four transfer points.

2. Training programs must be written and training provided to existing, new or transferred servicemen to specify the procedures for belt conveyor inspection, servicing and cleaning.

3. Transfer point lighting must be improved and be accorded a high priority for maintenance in accordance with the *Health, Safety and Reclamation Code* Part 2.9.1 and ANSI R.P-7-1979.

4. Pullcords should be lowered in the transfer point locations and extended to the head pulleys.

5. Portable two-way radios should be acquired and provided to the belt conveyor servicemen on a trial basis. If the servicemen and supervisors find them to be an asset, they should be treated as required equipment to be provided by the company.

The following account was kindly provided by the British Columbia and Yukon Chamber of Mines, via the British Columbia Mining Association:

Andreas Hans Vogt, 36, senior geologist with **Bond Gold Canada Inc.**, died from a massive allergic reaction following a single wasp sting on August 15, 1991. Mr. Vogt had travelled via helicopter to examine a geological terrain near the toe of Nelson Glacier in the Nelson Creek Valley near Stewart in northern British Columbia. Mr. Vogt and his two companions were dropped off by toe landing, at which time he indicated that he would call back to the base camp for pick up from a hand-held VHF radio.

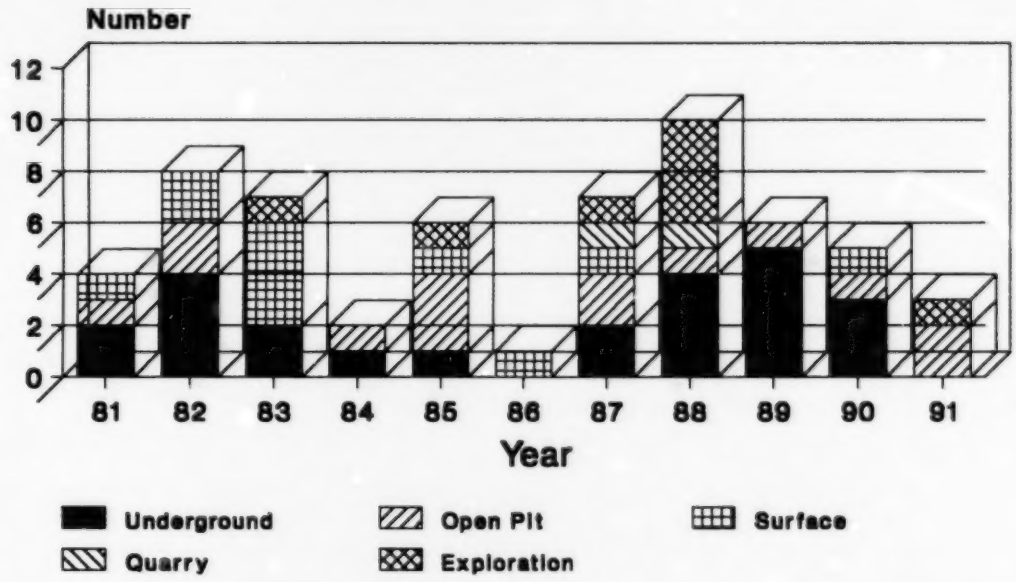
On arrival, Mr. Vogt descended to a small creek, presumably for water. On his return, he was rubbing his arm and stated that he had been stung. Very rapidly, he complained of dizziness, sat down to rest, became alarmed and asked his companions to call for help on the radio. He then lay down, rapidly becoming incoherent and losing consciousness within fifteen minutes. His companions, who were unfamiliar with the operation of the radio, were unable to contact the base camp; however, contact was later made with a B.C. Telephone Company operator, who rapidly contacted Stewart with a message for assistance being relayed to the base camp. Although Mr. Vogt's companions administered first aid treatment, including CPR procedures, he failed to revive, and was assumed to have died within one hour of the wasp sting.

The coroner's report was not available at time of writing; however, Mr. Russell Earl indicated to the B.C.&.Y.C.M. that his recommendation will focus on the need for all members of a party to be thoroughly familiar with the operation of radios in the event of emergencies. In addition, the B.C.&.Y.C.M. strongly recommends that all individuals operating in remote areas where medial treatment may not be readily available, carry an "Anakit" and be thoroughly familiar with its use. Anakits are available without prescription at drug stores at a cost of about twenty dollars per kit, weigh about two ounces, and have a shelf life of about one year.

British Columbia Mining Fatalities, 1981-1991

Year	Underground	Open Pit	Surface	Quarry	Exploration	Total
1981	2	1	1	0	0	4
1982	4	2	2	0	0	8
1983	2	0	4	0	1	7
1984	1	1	0	0	0	2
1985	1	3	1	0	1	6
1986	0	0	1	0	0	1
1987	2	2	1	1	1	7
1988	4	1	0	1	4	10
1989	5	1	0	0	0	6
1990	3	1	1	0	0	5
1991	0	2	0	0	1	3
Total (#)	24	14	11	2	8	59
Total (%)	40.68%	23.73%	18.64%	3..39%	13.56%	100.00%

B.C. Mining Fatalities
1981-1991



(Surface includes buildings, roads and other surface facilities)

6.2. ACCIDENTS CAUSING DEATH OR INJURY

The accident frequency rate at mines is the number of lost workday accidents per 200,000 exposure hours. In 1991 this rate averaged 6.26 for all operating mines and 10.40 for mineral exploration projects. This is a slight decrease over 1990 (6.42) for operating mines; however accidents at mineral exploration sites have increased over 1990 (6.73). Note that, for the sake of reporting continuity, the accident frequency rate for producing mines is that quoted by the Mining Association of British Columbia; the data for mineral exploration is that reported by the British Columbia and Yukon Chamber of Mines.

The Mining Association figures reflect all compensable accidents including injuries of a minor nature, whereas MEMPR statistics given in the tables on the following pages report only the more severe accidents; therefore the Mining Association statistics are higher than those reported by the Branch.

B.C. Accident Frequency Rate by Company, 1991

Company	Hours Worked	Freq. Rate	No. Accidents	Severity Rate	Days Lost
UNDERGROUND					
Cassiar***	579,222	11.74	34	256	740
Cheni	300,171	13.33	20	603	905
Golden Bear***	169,575	5.90	5	50	42
Snip**	286,302	9.78	14	520	744
Sullivan	1,368,049	11.70	80	354	2423
Teck-Beaverdell*	5,112	78.25	2	156	4
Myra Falls***	1,014,674	8.48	43	197	1000
TOTAL U/G	3,723,105	10.64	198	315	5,858
OPEN PIT					
Afton***	289,013	4.84	7	78	113
Baymag**	76,800	0.00	0	0	0
Bell Copper***	543,624	1.47	4	33	91
Brenda***	142,349	4.21	3	14	10
Endako***	488,427	3.28	8	2,479	6,055
Equity Silver	378,544	2.11	4	23	44
Gibraltar	691,089	6.37	22	207	717
Highland Valley***	2,343,049	1.37	16	17	196
Holnam West	101,450	9.86	5	150	76
Island Copper	1,227,495	4.89	30	35	217
Nickel Plate	405,244	0.49	1	18	36
Samatosum	168,802	3.55	3	28	24
Similco***	411,788	12.63	26	542	1,116
Westmin-Premier	251,254	0	0	0	0
Westroc	35,320	0	0	0	0
TOTAL OPEN PIT	7,554,248	3.42	129	230	8,695
TOTAL LODE	11,277,353	5.80	327	258	14,553
COAL					
Balmer***	2,685,144	11.47	154	687	9,224
Brinco-Quinsam	125,631	19.10	12	145	91
Bullmoose***	682,290	2.35	8	56	191
Byron Creek	348,527	2.87	5	32	56
Fording***	1,784,926	3.47	31	97	862
Greenhills***	1,263,765	6.49	41	78	492
Line Creek Res.***	936,497	3.42	16	85	396
Quintette	2,818,622	6.53	92	51	717
TOTAL COAL	10,645,401	6.74	359	226	12,029
ALL MINES	**21,922,754**	**6.26**	**686**	**243**	**26,582**

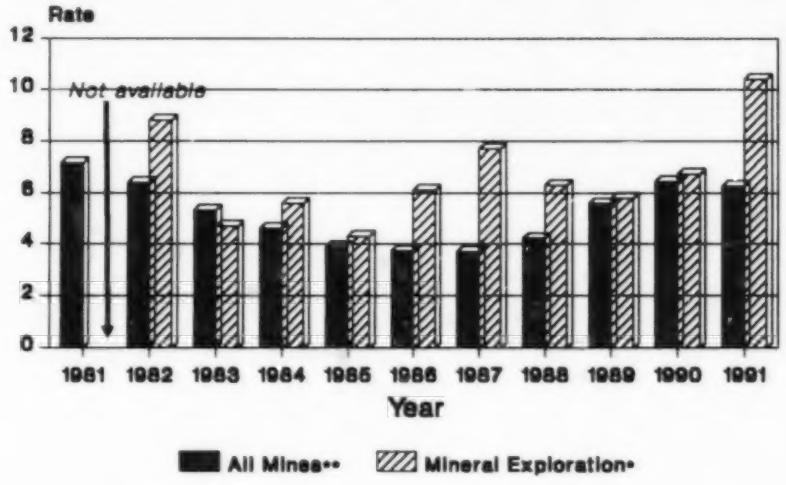
* Year-to-date figures inclusive of January 1991 only.

** Year-to-date figures not previously reported for 1991.

*** Year-to-date figures revised for 1991.

Fluctuations in the accident frequency rate over the past decade are shown in the following graph:

B.C. Accident Frequency Rates
Per 200,000 Manhours, 1981-1991



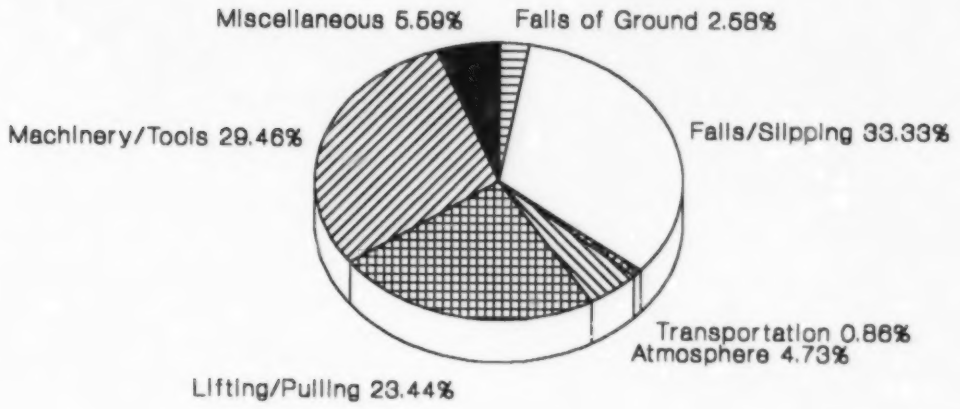
* Source: BC&YCM
**Source: MABC

The following tables classify the accidents causing death or injury that were reported to the Branch by cause, occupation and parts of the body injured.

Accidents causing Death or Injury
Classified by Cause, 1991

Cause	Number of Accidents	Percentage
Atmosphere	22	4.73%
Explosives	0	0.00%
Falls of Ground	12	2.58%
Falls/Slipping of Persons	155	33.33%
Lifting/Pulling/Handling Material	109	23.44%
Machinery and Tools	137	29.46%
Transportation	4	0.86%
Miscellaneous	26	5.59%
Totals	465	100.00%

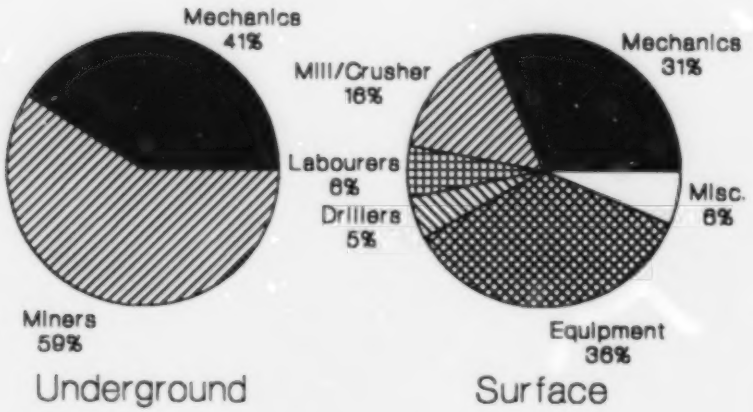
Accidents Causing Death or Injury
Classified as to Cause, 1991



Accidents causing Death or Injury
Classified by Occupation of those Injured, 1991

Occupation	Number of Accidents	Percentage
UNDERGROUND		
Miners	49	59.04
Mechanics (Electricians, Supplymen, Welders, etc.)	34	40.96
TOTAL UNDERGROUND	**83**	**100.0**
SURFACE		
Mechanics, Electricians, Repairmen	120	31.41
Mill and Crusher Workers	60	15.70
Labourers, Surveyors, Construction, etc.	23	6.04
Drillers, Powdermen	19	4.97
Equipment/Machine Operators	136	35.60
Miscellaneous	24	6.28
TOTAL SURFACE	**382**	**100.0**
TOTAL UNDERGROUND AND SURFACE	**544**	**100.0**

Accidents causing Death or Injury
Classified by Occupation, 1991



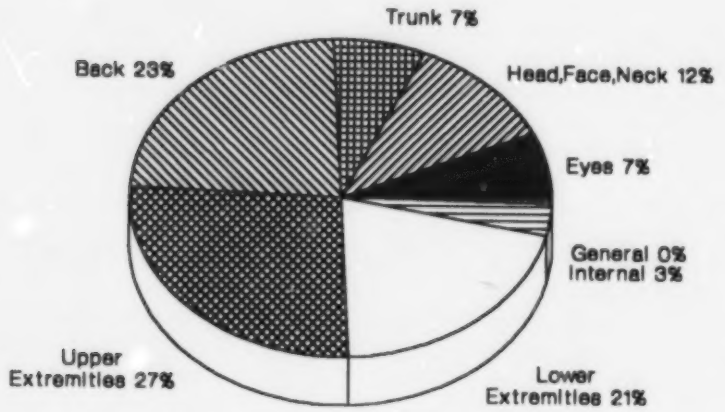
Accidents causing Death or Injury
Classified as to Parts of the Body, 1991

Location	Number of Accidents*	Percentage**
Eyes	36	6.84
Head, Face, Neck	62	11.78
Trunk	37	7.03
Back	123	23.38
Upper Extremities	140	26.61
Lower Extremities	109	20.72
Internal	17	3.26
General	2	0.38
Totals	526	100.00

* Total number of times each part of the body was injured. More than one part of the body may be injured in each accident, so the total number is greater than that shown in the previous two tables.

** Percentage of total accidents.

Accidents causing Death or Injury
Classified by Parts of the Body, 1991



6.3. DANGEROUS AND/OR UNUSUAL OCCURRENCES

Section 1.7.1 of the *Mine Health, Safety and Reclamation Code* requires the mine manager to report all accidents causing loss of life or serious personal injury, or any dangerous occurrence, within 16 hours of the incident to the Occupational Health and Safety Committee, the Chief Inspector or the relevant District Inspector, and the local union or employee association. Within one week, the manager is required to follow up with a written notification to the Chief Inspector and District Inspector. On completion of an investigation the manager must prepare a report on the incident and forward a copy to the relevant parties noted above.

The Resource Management Branch studies these occurrences and distributes information. It has been established that the detailed study of such occurrences and the dissemination of information about their causes, helps to reduce accidents. Condensed summaries of all occurrences are compiled and issued periodically by the Branch.

In 1990, the Chief Inspector initiated the development of the Mine Accident Reporting System (MINACC) to enhance the analytical capabilities of mine accident reporting in the Province. MINACC captures mine accident and dangerous or unusual occurrences at minesites and exploration operations throughout the Province in a standardized format acceptable to the Branch. The analytical capabilities of the system produce comprehensive reports for mine managers to use at their mines as well as for in-depth reporting requirements - both of which provide valuable insight into accident prevention strategies.

MINACC is an innovative database application designed by the Branch which will run on any IBM compatible personal computer. The MINACC software is accompanied by complete installation instructions with user documentation. The menu driven system is easy to follow and therefore does not require extensive user training. In addition, a Helpline is available to provide telephone support to users.

MINACC was implemented within a six month period from October, 1991 to March, 1992 by two co-op students from Simon Fraser University (Karen Essex and Deirdre Caune), who were responsible for the installation of the MINACC system and training personnel at mines. Their training strategy included sessions at individual mines and group tutorials, followed by a visit to each of the participating mines to install and review MINACC.

MINACC has been installed at the following B.C. mines (27 in total): Brinco Coal, Island Copper, Myra Falls, Construction Aggregates, Goldstream, Highland Valley, Nickel Plate, Similco, Baymag, Byron Creek, Fording, Line Creek, Sullivan Mine and Concentrator,Westar Balmer, Cominco Snip, Westar Greenhills, Westroc, Bullmoose, Gibraltar, Endako, Quintette, Cassiar, Cheni, Equity Silver, Golden Bear, Bell Mine, and Premier Gold. In addition to training staff at the mines, the students provided training at each of the six regional Branch offices to prepare staff prepare to receive the MINACC data from the mines.

As part of a nation-wide accident prevention strategy, MINACC has been made available to other jurisdictions, and is currently being used by the Northwest Territories, Yukon and New Brunswick. An international non-governmental organization called SMI (Small Mining International) has also shown interest in the MINACC system, searching for methods to serve the information needs of the small-scale mining community worldwide. A copy of MINACC has also been sent to the International Labour Organization in Geneva for distribution to less developed countries. Energy, Mines and Resources Canada in Ottawa is currently writing conversion programs to integrate our system with the national database.

The Branch has also distributed a questionnaire to mines which have implemented MINACC, and their suggestions regarding additional useful reports may be incorporated into the system. To ensure data integrity, a tracking procedure is being developed to ensure all vital information is entered into the system. A quarterly reporting format is also being developed to provide the mines with province-wide figures. Methods of targeting "population at risk" data are also being investigated.

MINACC is available to any mine wishing to use it, and demonstration times can be set up for those interested by contacting Sophia Collier of the Resource Management Branch, Room 105-525 Superior Street, Victoria B.C. V8V 1X4. Tel: (604) 356-2196 Fax: (604) 387-5985.

6.4. BLASTING CERTIFICATE SUSPENSIONS

Two blasting certificate suspensions occurred in 1991.

Mr. Claude Blagdon's certificate was suspended for a period of two months for contravening Sections 8.6.5(3) and 8.7.1(2) of the *Mine Health, Safety and Reclamation Code* by drilling too close to explosives and failing to mark a missed hole.

Mr. Wayne Biccum was in contravention of Section 8.7.1(1) and (2) of the *Code*, which reads:

8.7.1 Drilling shall not be carried out

(1) Within 300 mm of a bootleg on the surface or within 150 mm underground, or

(2) Where any part of the hole to be drilled could come within 1.5 m of a hole containing explosives except if it is drilled under the direct supervision of a shiftboss to clear a blocked hole, or to place an additional hole for blasting a misfired charge in accordance with section 8.6.6(1).

Mr. Biccum's blasting certificate was suspended for three months.